21 JULY 1960

ONE SHILLING
AND SIXPENCE

ELECTRICAL TIMES

The NEW range of—

"MEMREX-EXEL" 500 volt Switchgear

PRESSED STEEL ENCLOSURES
FOR LIGHTNESS AND STRENGTH.
FRONT OPERATING SWITCH HANDLES.
REWIRABLE OR H.R.C.
10—15—30 Amp. Switches
10—15—30—60 Amp. Switchfuses.

Modern styling, sound technical performance and compliance with all relevant British Standard Specifications are basic essentials. The range complies with the most strict interpretation of I.E.E. Regulations (13th edition), and with the requirements of The Electricity (Factories Act) Special Regulations.

Features include

Cases of one piece pressed steel with hinged covers, rustproofed and finished light grey stove enamel.

Front operating switch handles improve appearance and permit more compact assemblies on switchboard and panels.

Fuses are of the new "Kantark-Exel" pattern which will accept rewirable or H.R.C. fuses. Semi-enclosed rewirable (damper type) patterns comply with B.S. 3036: 1958.

M.E.M. H.R.C. cartridge fuse carriers are designed to accommodate H.R.C. cartridge fuse-links made to B.S.88: 1952, Appendix 'J' Dimensions, Form A—Offset Tags.

M.E.M. H.R.C. cartridge fuse-links have been A.S.T.A. certified for Categories of Duty 440 A.C.3 (16,500 amps.), 440 A.C.4 (33,000 amps.) and 440 A.C.5 (46,000 amps.).

WRITE FOR LIST 447J

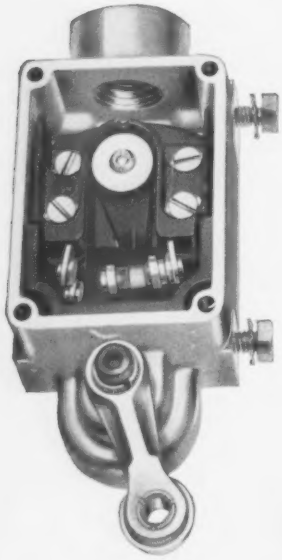
"Memrex-Exel" switches comply with the relevant Temperature Rise and Making and Breaking Capacity Tests of B.S. 861: 1955 and Switchfuses B.S. 2510: 1954.

MEM

All these and many other features.

MIDLAND ELECTRIC MANUFACTURING CO. LTD.
REDDINGS LANE, TYSELEY, BIRMINGHAM, 11.

A STYLE APPLICABLE TO EVERY INDUSTRY



Two only replaceable assemblies in the electrical side: moulded one-piece contact block and arm. Interchangeable on all Mark II versions.

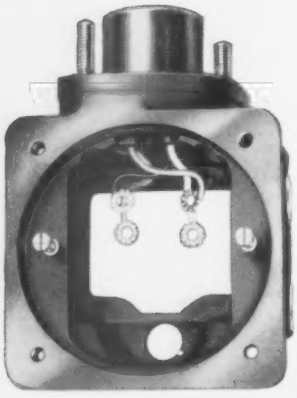
Water Oil and Dustproof or Flameproof versions

STANDARD

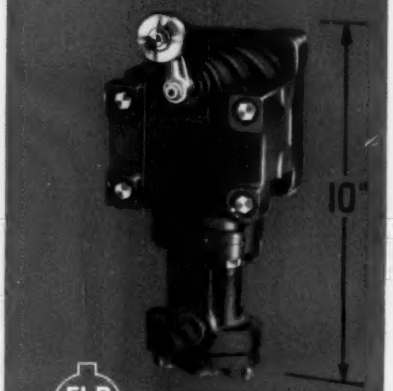
WATER, OIL & DUSTPROOF

Single pole, double break, double throw, operates with either circuit normally open with other closed, or maintaining in either position, or available with central (neutral) position and/or centre connection. Heavy aluminium die-cast case. Conduit ¾" B.S., or No. 3 Admiralty Pattern Cable gland entry. Two-screw side mounting or backplate mounting in two styles, or Tandem style (back to back mounting). Operating lever position adjustable in 7.5 deg. increments through 82.5 deg. either way from normal.

Standard Neutral position or Centre connection



The mechanism of the Flameproof switch is easily removable as a unit for servicing.

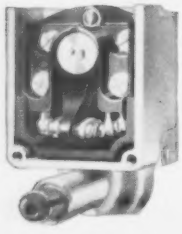


FLP FLAMEPROOF

SINGLE OR DOUBLE ENTRY

Buxton certificates No. 3574 (Group I) No. 3575 (Groups II and III gases). Meehanite iron castings. Self wiping solid silver contacts, interchangeable plugs and sockets. ***Single SWA cable entry (standard); double entry if required.*** *Operating lever position adjustable in 7.5 deg. increments through 360 degs. Single pole, double break, having one normally closed and one normally open circuit. Available with central (neutral) position and/or centre connection.*

MARK II

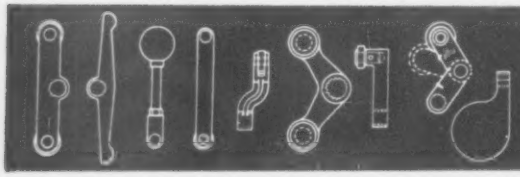


B.S.A. SNAP-LOCK ACME

Catalogue of switches and levers on request

HEAVY DUTY LIMIT SWITCHES

471

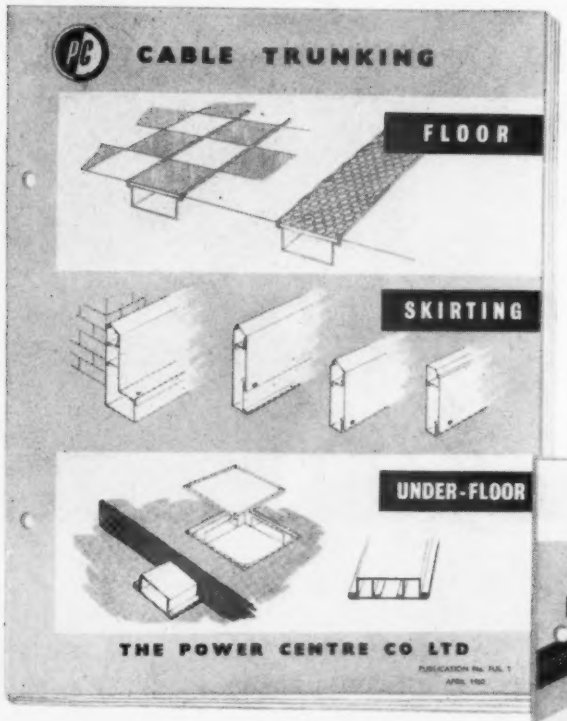


A few examples from the range of more than 40 styles (over 150 sizes) of interchangeable operating levers. List on request.

Made in England under Licence by
B.S.A. SMALL TOOLS LTD., BIRMINGHAM, 11

Sole Agents U.K.

BURTON GRIFFITHS & Co Ltd
SNAP-LOCK DEPT MONTGOMERY STREET
BIRMINGHAM 11. Tel: VICTORIA 2351



NEW FEATURES

New range of surface trunking fittings in steel.

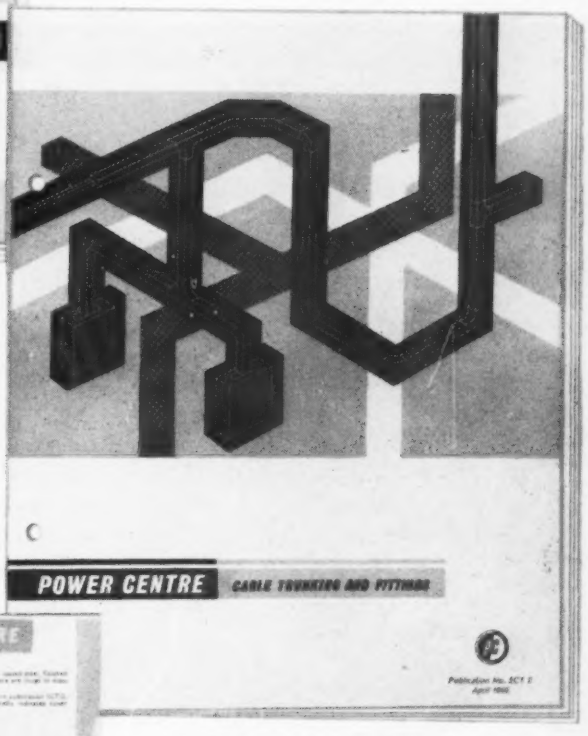
NEW PRICES

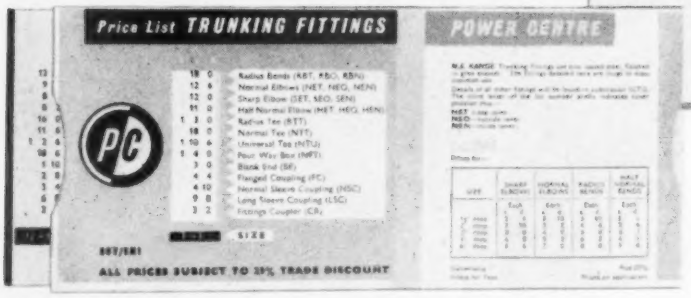
Many changes in the Power Centre price range. Write for full details.

NEW LITERATURE

These two new publications (SCT 2 and FUS 1) covering surface, floor, underfloor and skirting trunking are now available. The entire range is illustrated and sizes and prices are given in every case.

AND NEW PRICE CALCULATOR





"Slide-rule" calculator shows at-a-glance prices for trunking and fittings in all sizes. List and trade prices are given for varying lengths of light and heavy-gauge trunking.

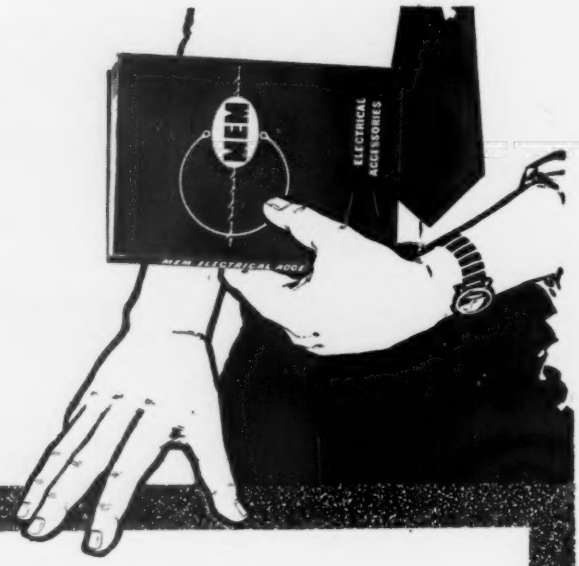
WRITE FOR DETAILS TO

POWER CENTRE CABLE TRUNKING AND FITTINGS

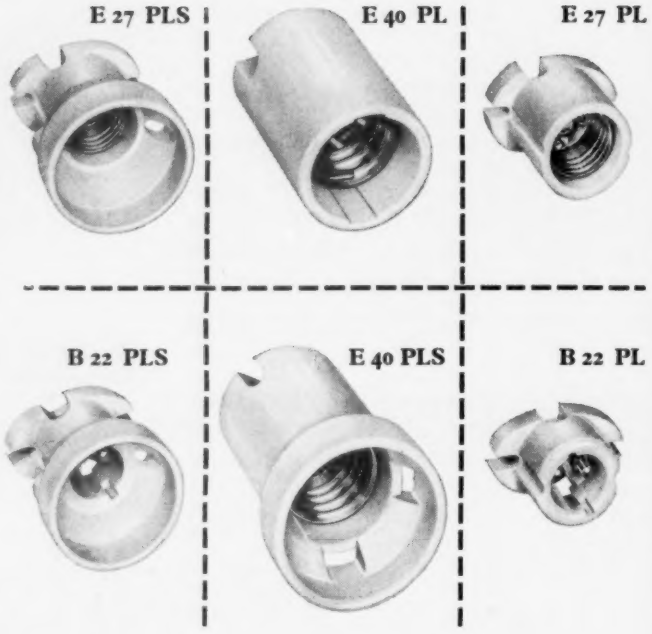
THE POWER CENTRE CO. LTD., P.O. BOX No. 18, LLOYD STREET, WEDNESBURY
Telephone: WEDnesbury 1311

PC 960

Electrical accessories from the MEM range



A well-designed range of porcelain batten lampholders in Bayonet cap and Edison Screw patterns, with and without Skirts. B.C. Lampholders are fitted with spring-loaded brass plungers. The Goliath E.S. patterns have spring-loaded central contacts to ensure efficient contact pressure.



MEM

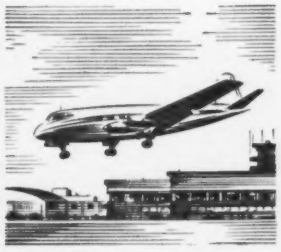
PORCELAIN LAMPHOLDERS

The full range is detailed in the new 88-page catalogue. Write for your copy today, List No. 435. T

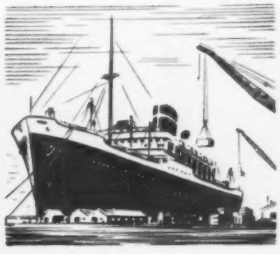
MIDLAND ELECTRIC MANUFACTURING CO. LTD
REDDINGS LANE, TYSELEY, BIRMINGHAM 11

Leading the World in Fire Safety

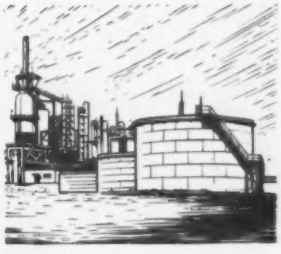
TRANSPORT *From the smallest car to the largest commercial vehicle on the road as on the most modern Diesel locomotives. Pyrene Fire Protection is the first choice, In garages and service stations too.*



AIRCRAFT *Pyrene Fire Detecting and Fire Extinguishing Equipment and Pyrene Crash Tenders are specified to safeguard civil and service aircraft, as well as airfields and airports all over the world.*



SHIPPING *As well as protecting ships of the Royal Navy, Pyrene Fire Protection Systems safeguard passenger and cargo ships, tankers, tugs, docks and harbours throughout the world.*



OIL *In the processing and storage of oil, and the production of petroleum, fuel and lubricating oils and all by-products—highly specialized Pyrene Fire Equipment—mobile, portable or fixed—is in universal use.*

Take for instance these

"Pyrene" fire safety developments

in the electrical world

In every industrial and commercial enterprise the world over, the name "Pyrene" has been associated with major advances in fire fighting equipment for nearly half a century. Today, in the electrical world—in electronics—as well as nuclear research and development —"Pyrene" Fire Detecting and Fire Extinguishing Systems and Equipment are most widely adopted for instant and efficient protection. Constant experiment and development by Pyrene research engineers as well as unrivalled experience has led to the most modern automatic fire warning and CO_2 extinguishing installations for generating stations and sub-stations, protecting oil-filled switchgear, alternators, transformers, generators, cables etc. The "Pyrene" range of portable and mobile CO_2 fire extinguishers provides against every contingency in any part of the premises: other fire appliances employing special liquids, dry powder, and foam are provided to meet every class of fire danger in the electrical industry. May we co-operate with you on *your* fire problem? If so—please write to DEPT. E.T. 7 9, GROSVENOR GARDENS, LONDON, S.W.1. *Tel:* VICTORIA 3401.

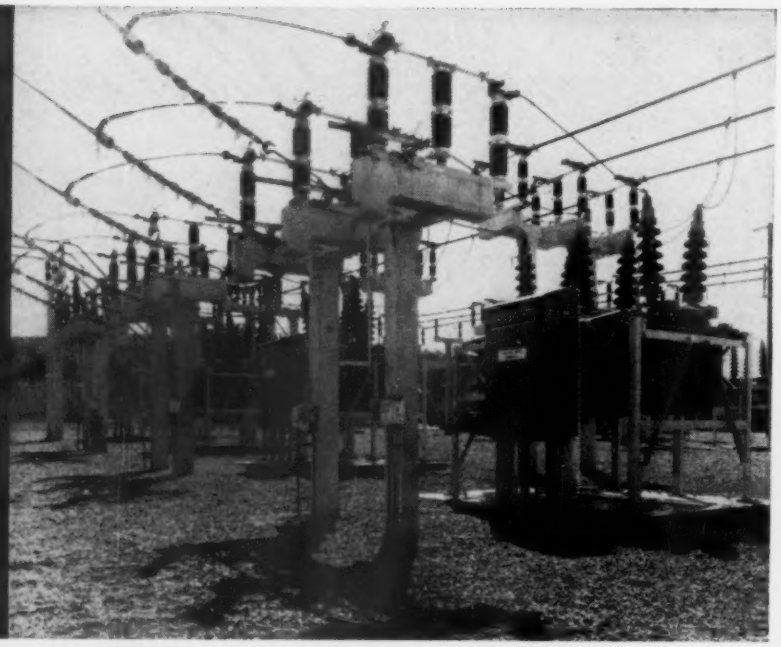
BY APPOINTMENT TO H.M. THE QUEEN
SUPPLIERS OF FIRE EXTINGUISHERS
THE PYRENE COMPANY LIMITED

THE Pyrene TRADE MARK COMPANY LIMITED

famous for fire fighting progress for 46 years

Plants in Canada and Australia — Agencies throughout the World

For outdoor or indoor switchgear



. . . up to and including 66kV

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IN ASSOCIATION WITH
CROMPTON PARKINSON LIMITED
CROMPTON HOUSE · ALDWYCH · LONDON W.C.2

OWNERS OF AN APPROVED ASTA TESTING STATION

Bear it in mind

WOOTTON METER BOARDS

are the best!

Use *proves* their superiority—made from carefully tested material, and ready to stand up to weather hazards anywhere, WOOTTON Meter Boards are the *best*—and that's the bear truth.

and don't forget WOOTTON wood blocks, sunk switch boxes and instrument cases.

WOOTTON & CO. LTD., ALMA WORKS, PONDERS END, MIDDX.

Telephone: HOWard 1858

ROLLPIN

THE AMAZING MULTI-PURPOSE SELF-LOCKING SPRING PIN FASTENER

SAVES: INITIAL COSTS, INSTALLATION COSTS, PRODUCTION MAINTENANCE

Rollpin is a slotted and chamfered cylindrical spring pin, heat-treated for maximum toughness, resilience and shear strength.

Simple to insert or remove, Rollpins exert continuous spring pressure against the sides of the hole, preventing loosening by vibration. Dimensions and elastic limits are specially engineered to give this self-locking action in drillings to normal production tolerances. No reaming or secondary operations are required.

Rollpin can replace . . .
Rivets · cotter pins · stop pins · set screws
taper pins · hinge pins · dowel pins · grooved pins

Illustrated literature available on request.

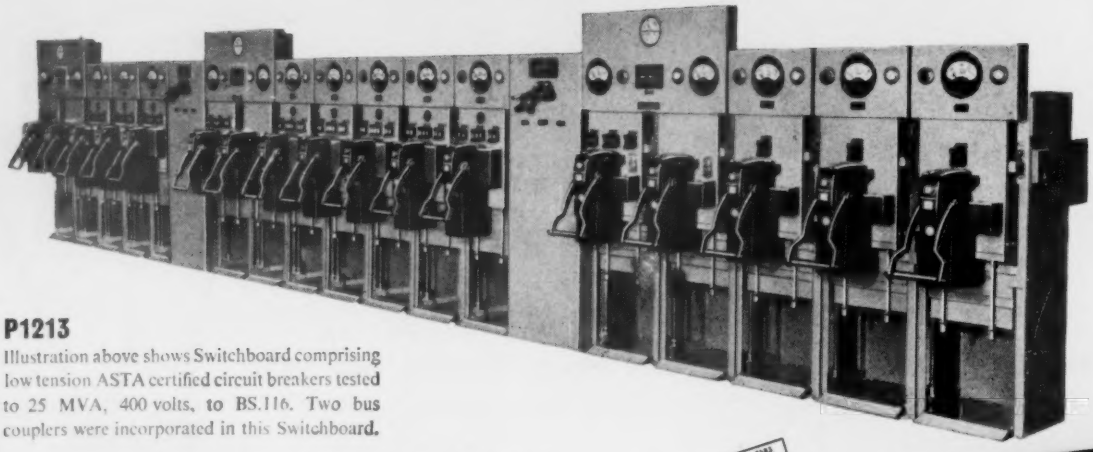
THE TEMPERED SPRING COMPANY LIMITED

SHEFFIELD
ENGLAND

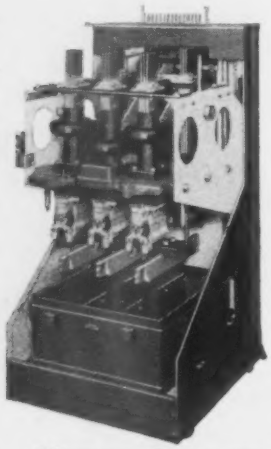
TELEPHONE 21333/4/5 · TELEX 54-103

FOR HEAVY DUTY

THE MB RANGE OF CIRCUIT BREAKERS ILLUSTRATED BELOW HAS BEEN SHORT CIRCUIT TESTED AT AN ASTA STATION, THE LOW TENSION RANGE HAVING A CERTIFICATE FOR 25MVA, 400 VOLTS. THE 3·3 KV RANGE 75 MVA, ALL TO BS. 116.

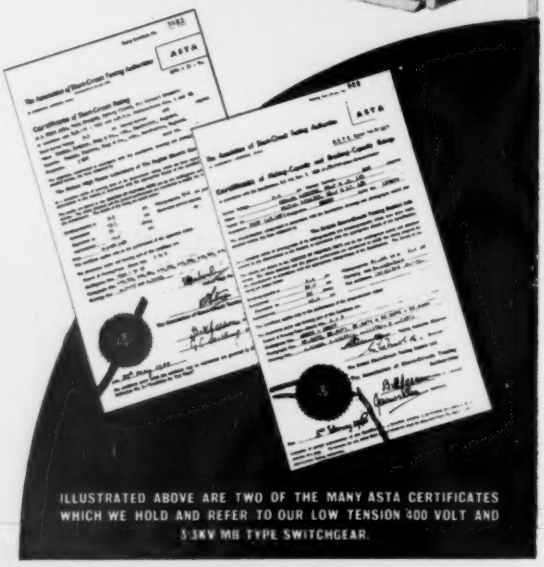


P1213
Illustration above shows Switchboard comprising low tension ASTA certified circuit breakers tested to 25 MVA, 400 volts, to BS.116. Two bus couplers were incorporated in this Switchboard.



P1245 The circuit breaker unit illustrated at the left is one of our 1600 amp. units of the same range as illustrated in the Switchboard above. It is of modern robust construction and suitable for controlling a 1000 kVA transformer. Our 1600 ampere unit has now been successfully tested at 31 M.V.A. 400 volts, to BS. 116.

May we have your enquiries?



ILLUSTRATED ABOVE ARE TWO OF THE MANY ASTA CERTIFICATES WHICH WE HOLD AND REFER TO OUR LOW TENSION 400 VOLT AND 3·3KV MB TYPE SWITCHGEAR.

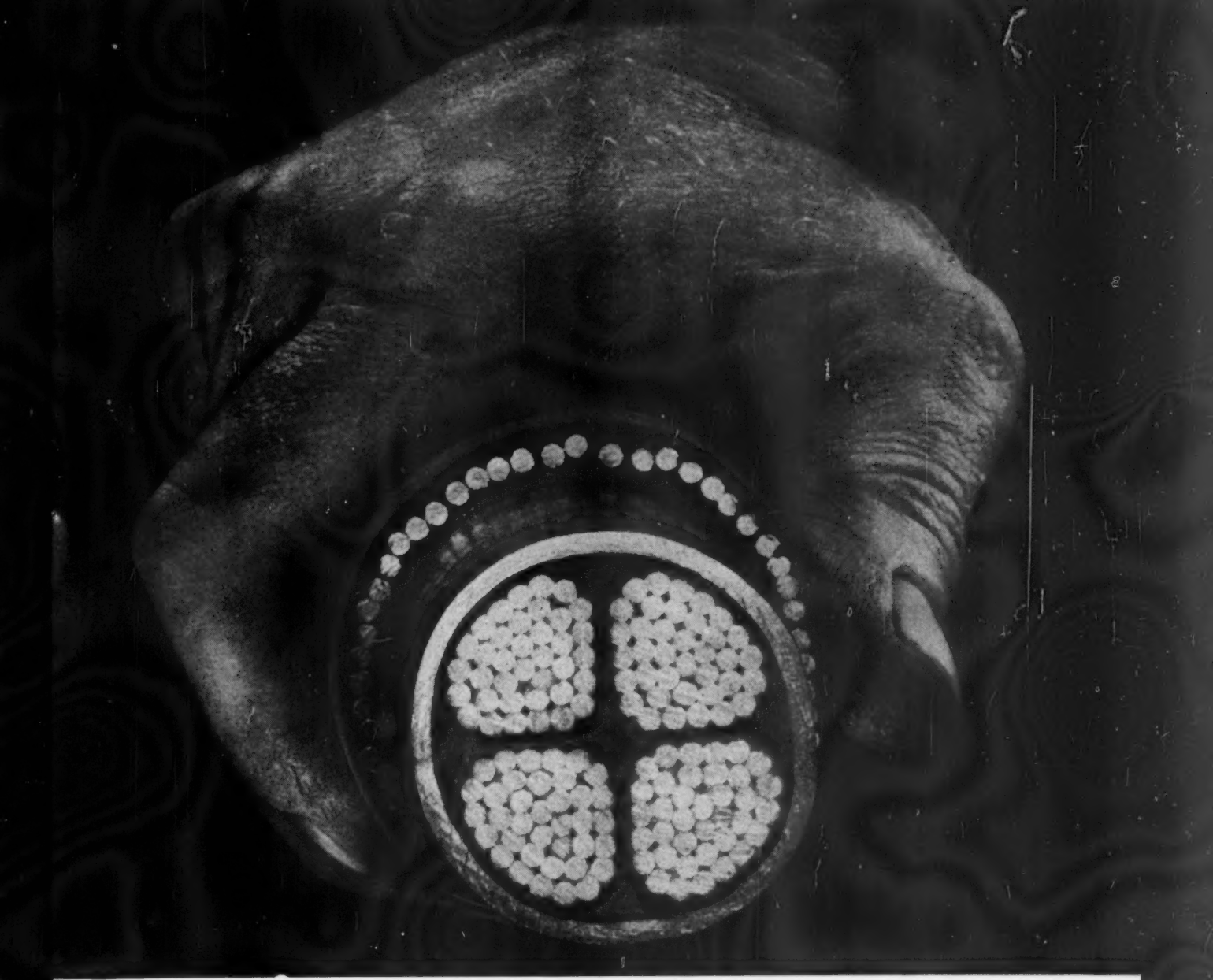
ERSKINE, HEAP & Co LTD

SWITCHGEAR SPECIALISTS

Head Office & Works
BROUGHTON, MANCHESTER (7)

London Office
GRAND BUILDINGS, TRAFALGAR SQ., W.C.2

BRANCH OFFICES AND AGENCIES IN ALL PARTS OF THE WORLD



Most Londoners who see modern aluminium cable like this being laid don't realize that last year it saved them £100,000 over conventional copper cables . . .

Last year this cable saved London £100,000. How?

Our picture shows a typical electrical cable. Notice its four conductors. They are made of aluminium instead of copper. By using cables with aluminium conductors, London saved about £100,000 last year. How?

The price of copper varies considerably. Recently it has fluctuated between £240 and £270 a ton; at times it has been much higher. Aluminium costs £186 a ton and its price is steady. More important, a ton of aluminium provides twice as much conductor material as a ton of copper. Consequently, aluminium is now the cheapest conductor material and, in nine cases out of ten, the most economical for the job. And because it is much lighter, aluminium cable is also easier to transport and lay. Jointing is easy and dependable.

Aluminium and power Progressive power authorities are turning to aluminium cables to help them offset rising costs. So is industry at large, for whether insulated with paper, rubber or plastic, aluminium conductors provide a much cheaper way of handling heavy currents—in factories, office buildings, mines and ships.

Alcan's part Through research, we are working to make sure that aluminium holds its lead as the cheapest conductor metal and that its many inherent technical advantages are fully exploited. With 4,650,000 h.p. of hydro-electric power at our elbow, we are smelting aluminium in tremendous volume, and as demand increases we can readily step up our capacity. This volume production helps to keep the price stable.

Any leading cable manufacturer will be glad to supply you with aluminium cables or give you further information about their use in industry. Or write to: **Alcan (U.K.) Limited, Aluminium Canada House, 30 Berkeley Square, London, W.1. Telephone: MAYfair 9721.**

Britain's most widely used aluminium

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ALUMINIUM LIMITED OF CANADA

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KNOWING THIS SWITCH HAS BEEN LIFE TESTED TO 19 MILLION OPERATIONS

When it MUST be RELIABLE and you need something more ROBUST than a micro-switch—this MINIATURE HEAVY DUTY LIMIT SWITCH may be what you're looking for

- CHANGE-OVER CONTACTS
- QUICK MAKE AND BREAK
- RATING 2 Amps 250v, 1 Amp 500v } A.C. Inductive
- MEASURES 3½"x2¼"x1¼" only

37/6 *Subject to usual discounts*

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and SPARE PARTS

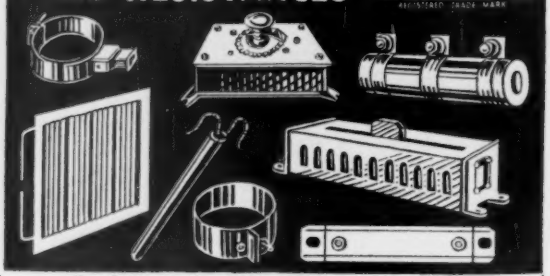
for AMERICAN CONTROLS

KEMPSTON ELECTRICAL CO. LTD.

KEMPSTON, BEDFORD. Phone: Kempston 2358

INDUSTRIAL HEATERS AND RESISTANCES

METWAY PRODUCTS



For full details ask for Catalogue JYL/30ET

METWAY · KEMP TOWN · BRIGHTON

cross-channel power link

The submarine power cable to be laid across the Channel between Dungeness and Boulogne will be similar to the cable shown here. This cable, which now connects British Columbia with Vancouver Island, was manufactured and laid by BICC in unjointed 16-mile lengths.

The Central Electricity Generating Board and Electricité de France have placed contracts for the manufacture and laying of the cross-Channel submarine power link.

Two 100,000 volt single-core submarine power cables will put England and France on one electrical grid—a new balance of power to ease mutual problems of supply and demand.

With a capacity of 160 megawatts (over 200,000 h.p.) in either direction, this submarine circuit will carry the heaviest D.C. electrical load ever transmitted under water.

Cables for the British section will be made by two famous companies—BICC and AEI—working in close collaboration.

BICC

submarine **power cables**

BRITISH INSULATED CALLENDER'S CABLES LIMITED 21 BLOOMSBURY STREET LONDON WC1

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HIGGS MOTORS LTD.

MANAGING DIRECTOR DAVID C.Y. HIGGS, A.M.I.E.E.

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TO

BRITISH STANDARD DIMENSIONS

CLASS 'E' INSULATION

OTHER MOTORS up to 1000 H.P. and GENERATORS up to 700 kVA

BELFAST · BRISTOL · CARDIFF · DUBLIN · DUNDEE · GLASGOW · HULL · LEEDS · LIVERPOOL
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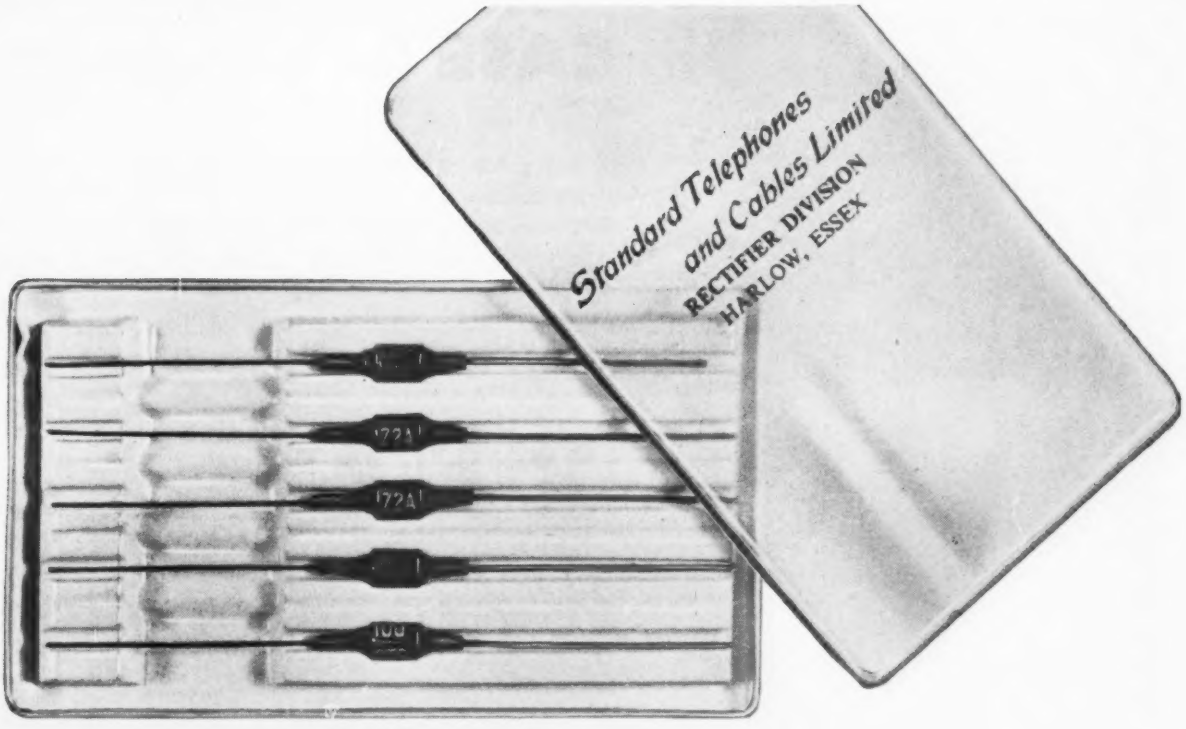


actual size

SenTerCel 1 WATT SILICON ZENER DIODES

- *Have a large dissipation for their size*
- *Are suitable for high temperature operation*
- *Have a low temperature co-efficient of voltage*
- *Are suitable for use as regulators, limiters, surge suppressors, and voltage references*
- *The first complete range of close-tolerance ZENER Diodes available from production*

Characteristics and ratings of SenTerCel Zener Diodes are given in publication MF/103

Z2 SERIES ZENER DIODES		
±5% Voltage Tolerance (Red and Green Sleeves)	TYPE	NOMINAL VOLTAGE
	Z2A33F	3.3
	Z2A36F	3.6
	Z2A39F	3.9
±10% Voltage Tolerance (Red and Yellow Sleeves)	Z2A43F	4.3
	Z2A47F	4.7
	Z2A51F	5.1
	Z2A56F	5.6
	Z2A62F	6.2
	Z2A68F	6.8
	Z2A75F	7.5
	Z2A82F	8.2
	Z2A91F	9.1
±20% Voltage Tolerance (Red and Blue Sleeves)	Z2A100F	10
	Z2A110F	11
	Z2A120F	12
	Z2A130F	13
	Z2A150F	15

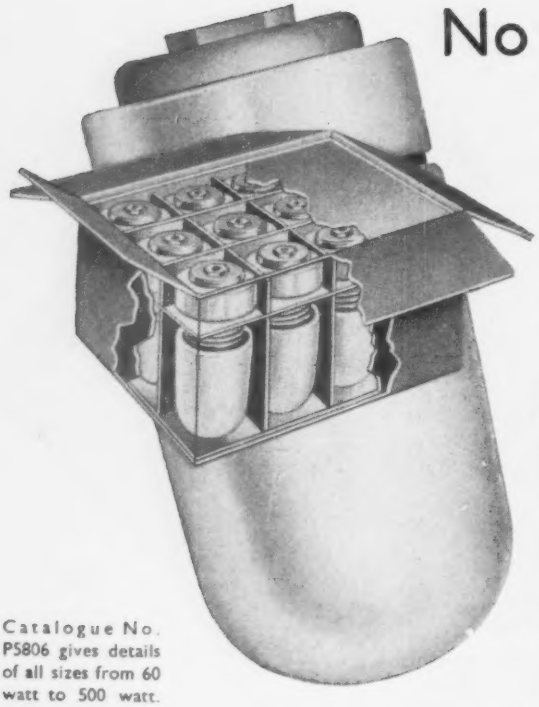
STC COMPONENTS GROUP

60 4MF

Standard Telephones and Cables Limited

Registered Office: Connaught House, Aldwych, London, W.C.2

RECTIFIER DIVISION: EDINBURGH WAY · HARLOW · ESSEX



Catalogue No. PS806 gives details of all sizes from 60 watt to 500 watt.

No **CASE** for complaint

With R.E.A.L. Watertight Fittings supplied by the dozen in this rail-certified container, customers can be certain that they'll arrive in perfect condition, with no lost rubber rings or lampholders . . . no straw-covered glass to clean . . . no breakages. Just a part of the service—R.E.A.L. service!

REAL

Watertight Fittings

Patent No. 568702

PERFECT PROTECTION IN THE PERFECT PACK

R.E.A.L. *is the registered trade mark of*
ROWLANDS ELECTRICAL ACCESSORIES LTD., R.E.A.L. Works, Birmingham 18

EARTH CIRCUIT MONITORING UNITS

offer greater protection to your portable equipment

A full range of Earth Circuit Monitoring Units is available, up to 200 amps, incorporating either Automatic Circuit Breakers or Contactors; the Units can also be arranged for tripping of remote Switchgear. Current Balance Earth Leakage Protection is incorporated when required.

Interlocked switch plug-sockets can be supplied, either incorporated in the Monitoring Unit, or mounted separately, which permit **the monitoring of a number of portable equipments from a single Monitoring Unit.**

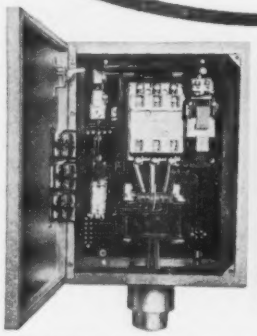
All in sheet steel dustproof enclosures.

WRITE FOR FULL PARTICULARS TO:—

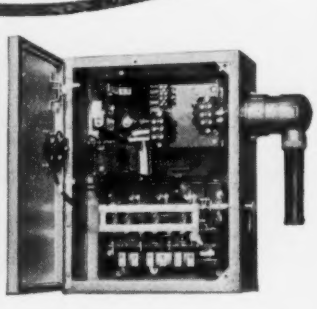
Siemens-Schuckert (Great Britain) Ltd

Read this extract from the 1958 Annual Report of the Chief Inspector of Factories

"The most important conclusion to be drawn from this analysis, is that accidents caused by portable and transportable electrical apparatus and their associated cables and accessories formed the largest proportion of electrical accidents . . . In this field there is need for special effort to reduce accidents".



Unit CEM-50 incorporating a 50 amp Contactor with Earth Leakage Monitoring and Current Balance Earth Leakage Protection.



Unit BEM-30 incorporating a 30 amp Automatic Circuit Breaker, with Earth Circuit Monitoring and Current Balance Earth Leakage Protection.

Dept. S.98
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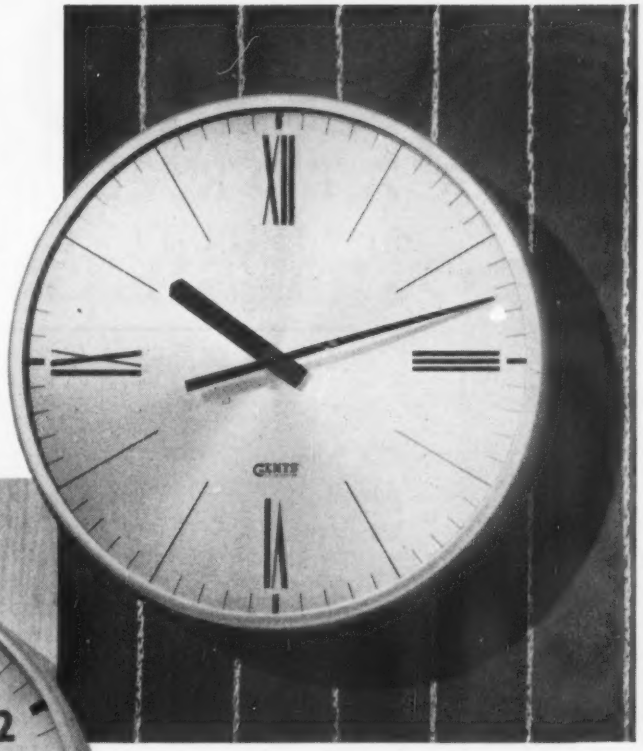
Smee's S.98

Maximum legibility and good taste are combined in the Gents wall clocks shown here.

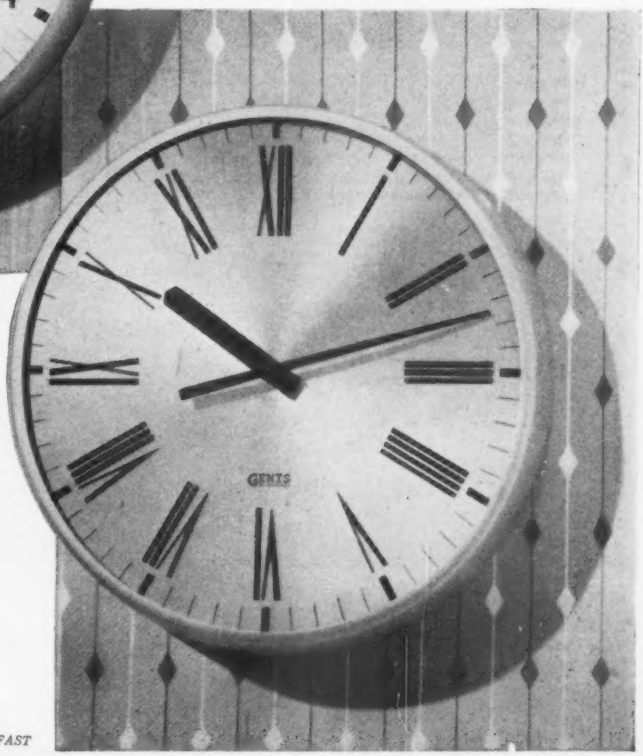
Styled by a leading industrial designer they provide a choice of standard models which fit happily into present-day surroundings and décor.

These and others in the extensive Gents range have been selected by the Council of Industrial Design for inclusion in Design Index.

All are available for operating either on A.C. Mains or as part of a Master Clock System.



In every way...Right!



Most models are now available from stock

Full details and literature on request

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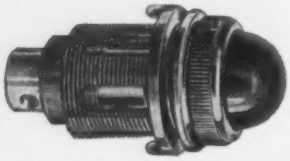

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No. 7773/M for Mains voltage Pygmy lamps

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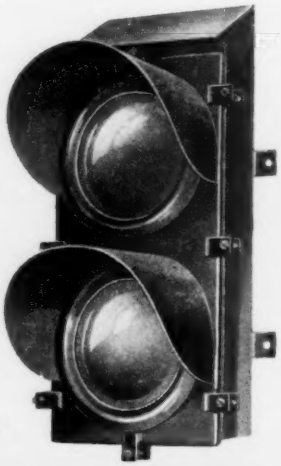

Illustration (Right) shows weatherproof Traffic Control Indicator recently manufactured

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also at GLASGOW and LONDON

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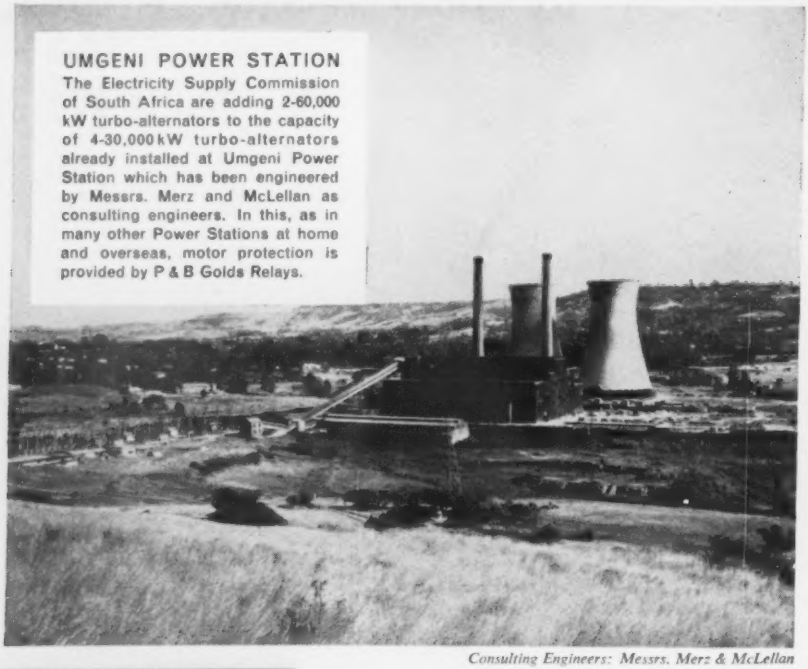
The Electricity Supply Commission of South Africa are adding 2-60,000 kW turbo-alternators to the capacity of 4-30,000 kW turbo-alternators already installed at Umgeni Power Station which has been engineered by Messrs. Merz and McLellan as consulting engineers. In this, as in many other Power Stations at home and overseas, motor protection is provided by P & B Golds Relays.

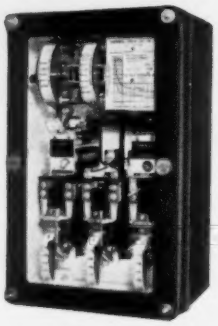


Consulting Engineers: Messrs. Merz & McLellan

THE ELECTRICITY SUPPLY COMMISSION choose P & B Golds Relays

P & B Relays give full protection for motors with any starting periods or currents under extremes of ambient temperature.

P & B Golds Relays protect against phase failure, overload, short circuit or earth fault. P & B Stalling Relays give complete protection against stalling under all conditions. Send for current literature.



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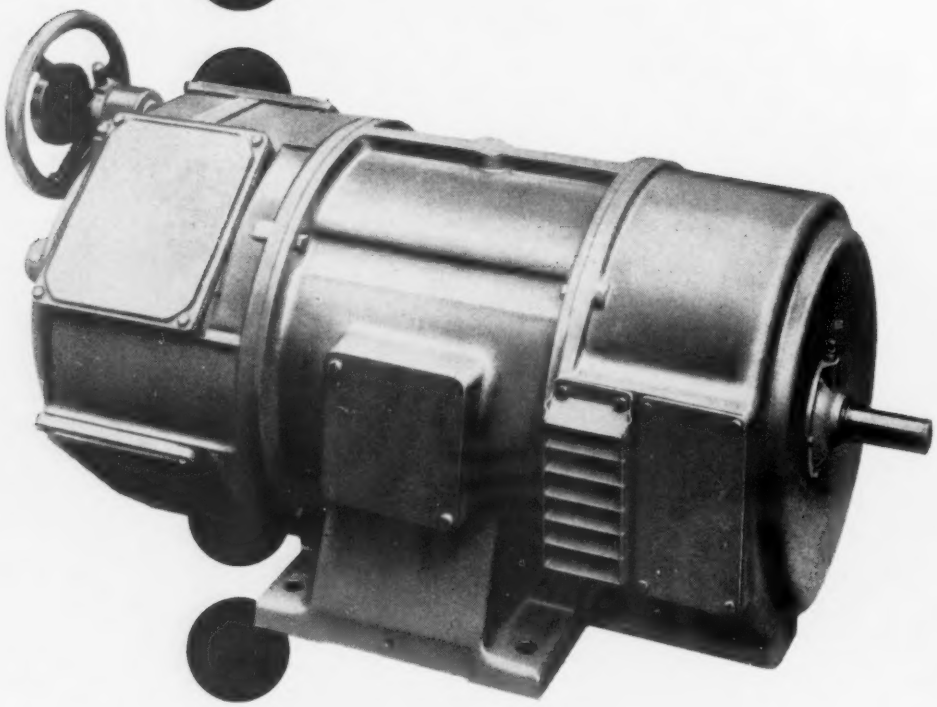

VARIABLE-SPEED A.C. MOTORS

COMMUTATOR-TYPE 2-phase or 3-phase

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Order for Dungeness nuclear station placed; goes to Nuclear Power Group, the AEI-John Thompson-Nuclear Power Plant Co. consortium. Two reactor, 550 MW station. Turbo-blowers for CO_2 operated by h.p. steam, exhaust reheated to 736°F for main set. (87)

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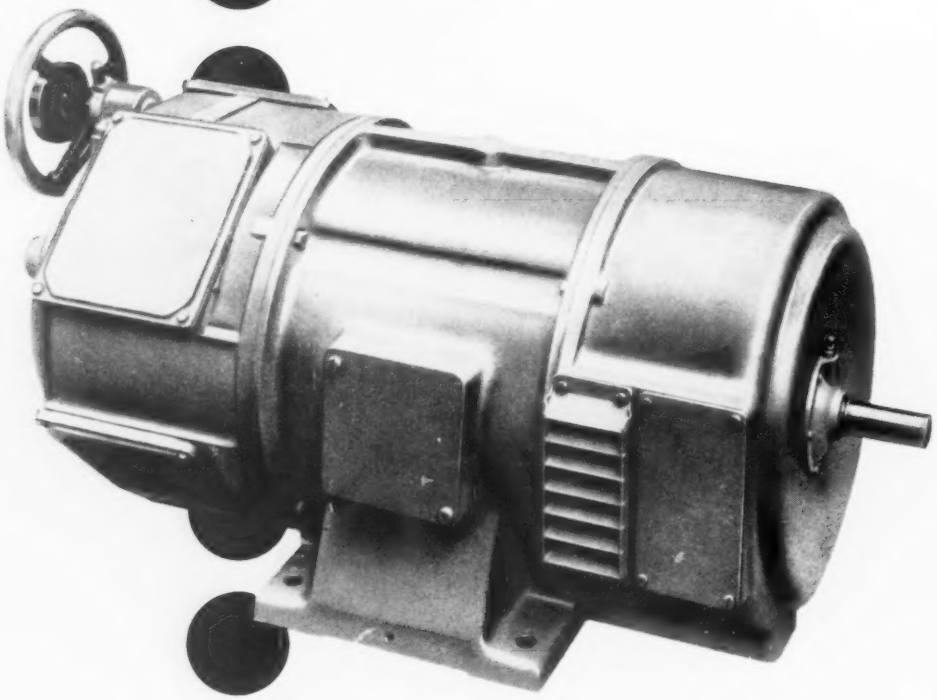

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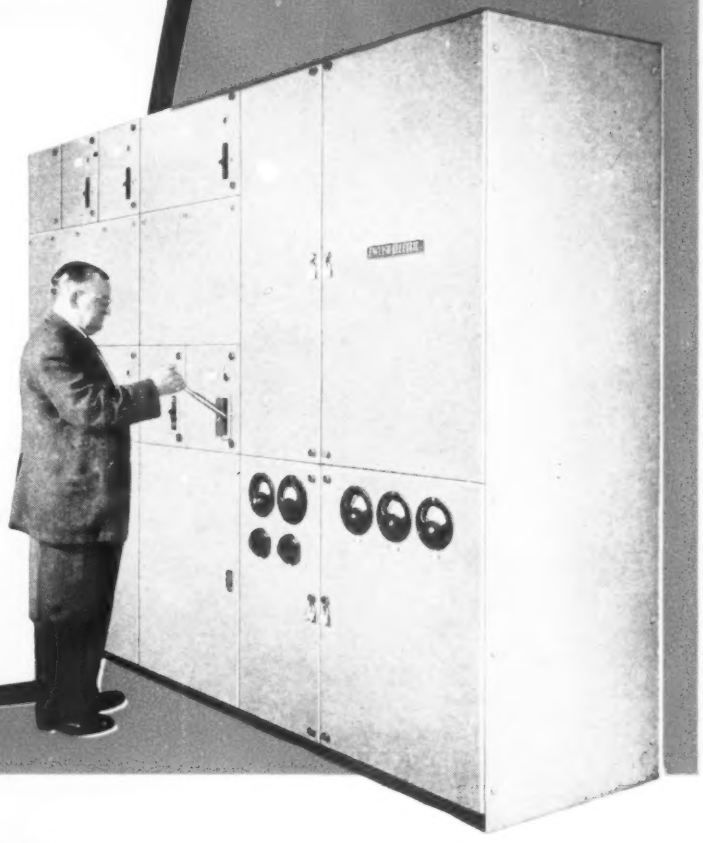
JOINT SWITCHBOARD INSTALLATIONS

REDUCE COSTS IN INDUSTRIAL SUBSTATIONS

The illustration shows a composite 'Superform' switchboard installed in the substation of a large warehouse in the Midlands. The switchboard accommodates both the Supply Authority's open type substation equipment and the outgoing circuits to the warehouse within the one unit. The busbars of the substation board and outgoing 'Superform' section are coupled together, both electrically and mechanically, making the composite Switchboard a complete entity.



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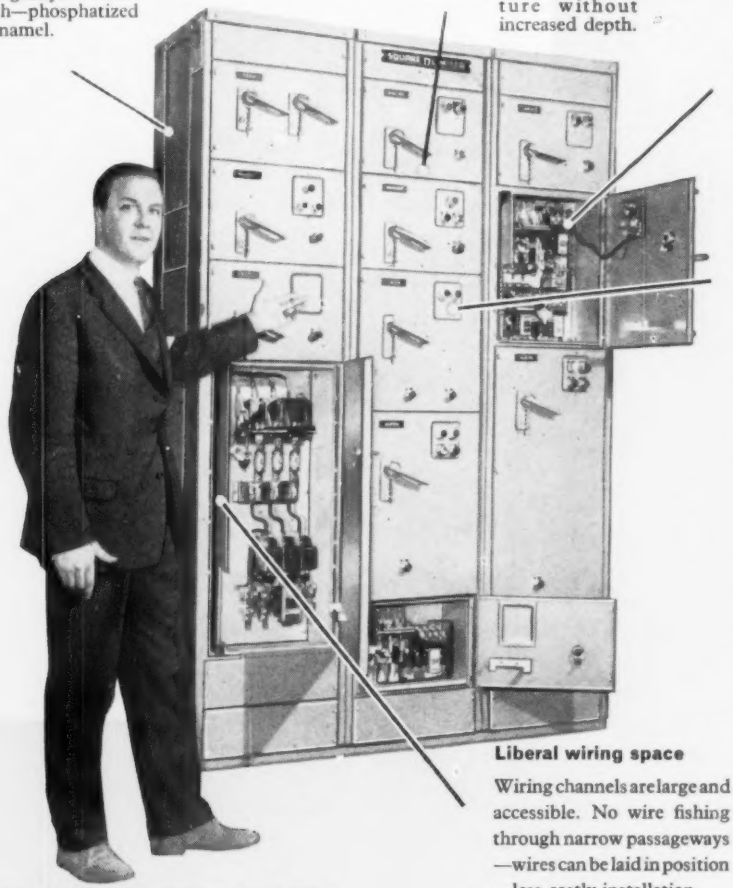

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Units are metal enclosed to confine damage should a fault occur. Unit side plates are permanently attached—can't be accidentally discarded. Switch-type units have visible blade disconnects for added safety.

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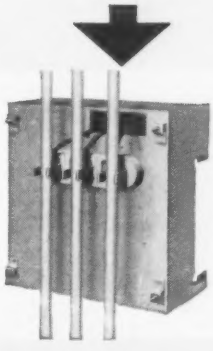
A variety of removable door-mounted panels accommodates up to four oil-tight push buttons and pilot lights.

Tubular vertical buses feed plug-in units
Another Square D "exclusive"—inherently stronger—greater cooling surface. Extra-wide spacing between phases gives added "breakdown" protection. Plug-in stabs are silver-plated copper backed by steel springs—give high pressure, low resistance contact at all times. Bus bars are also silver plated.



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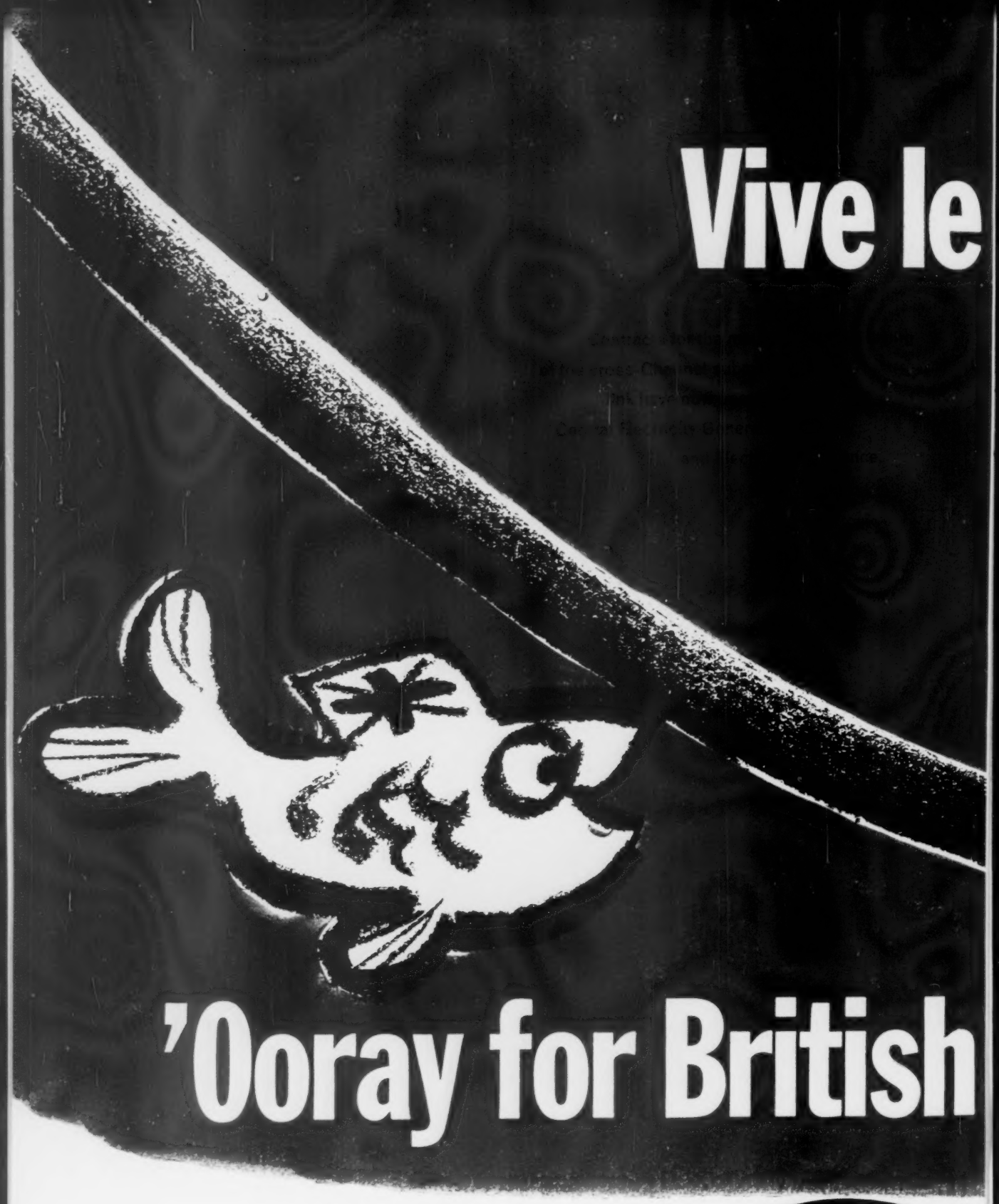

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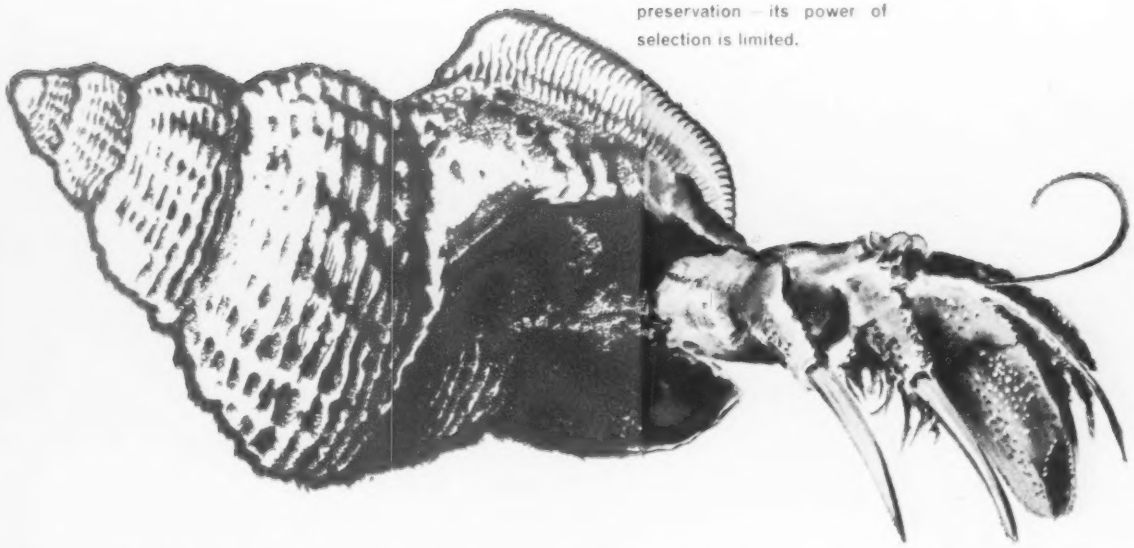

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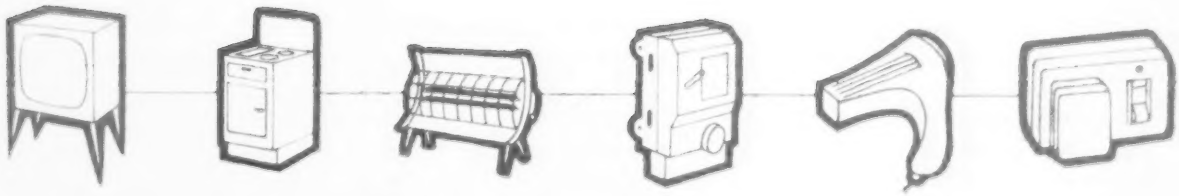

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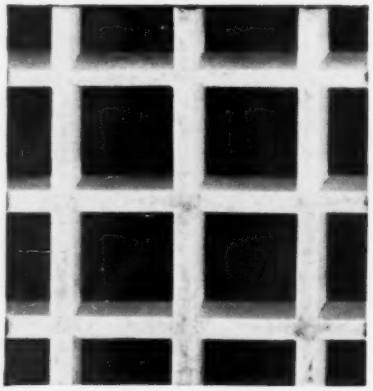
Beetle D.M.C. combines heat resistance with strength, dimensional stability and excellent insulation properties. The development of a special type for a single application typifies the extent of B.I.P. services in relation to individual problems and requirements.



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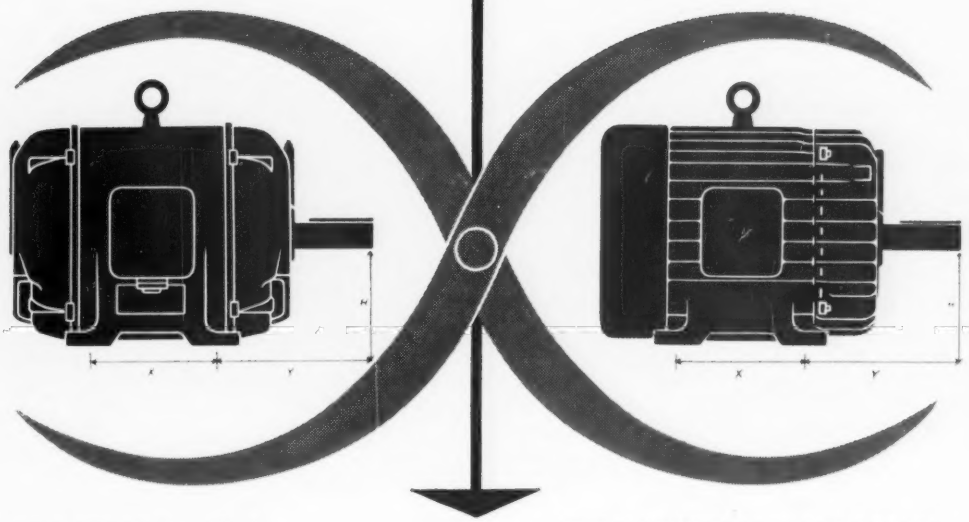

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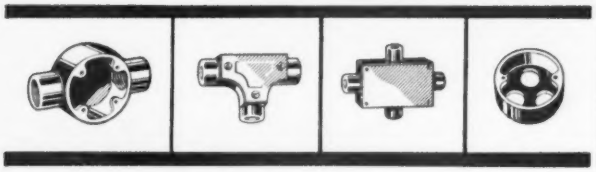

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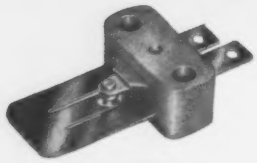

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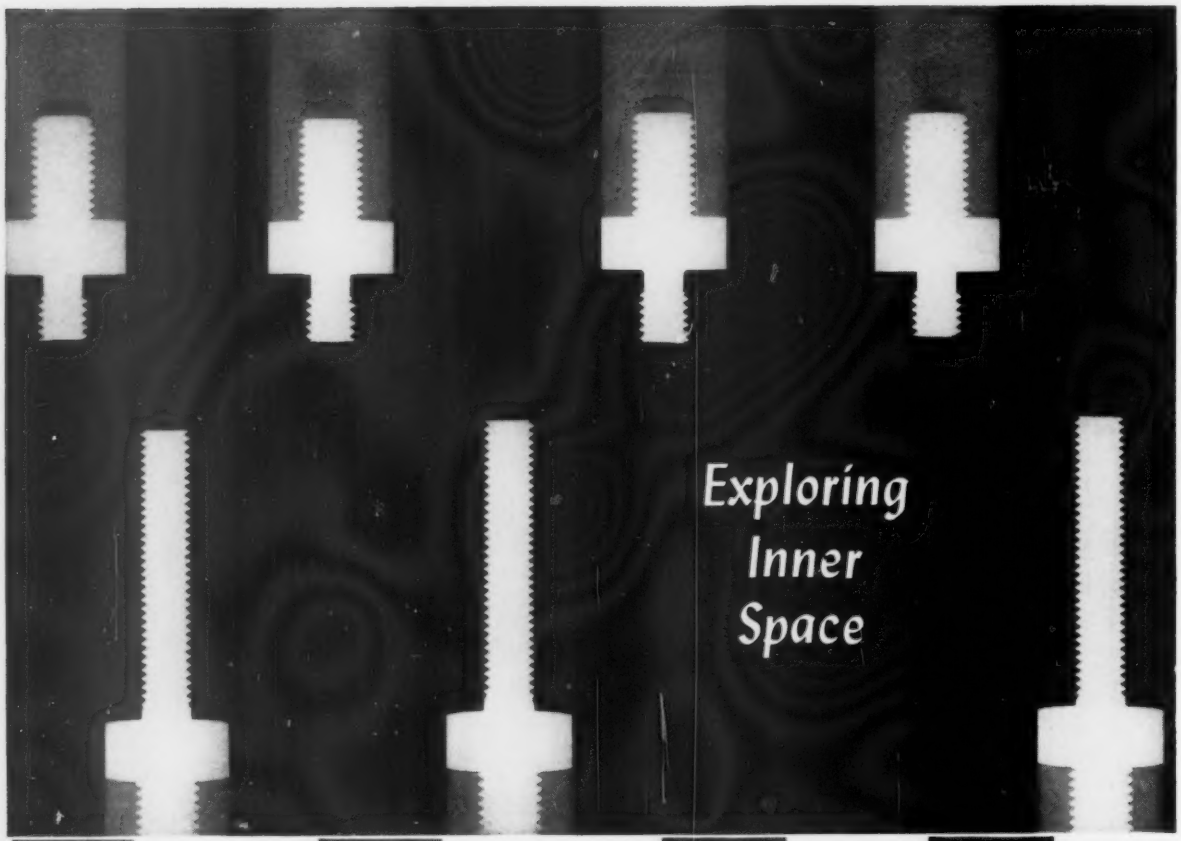

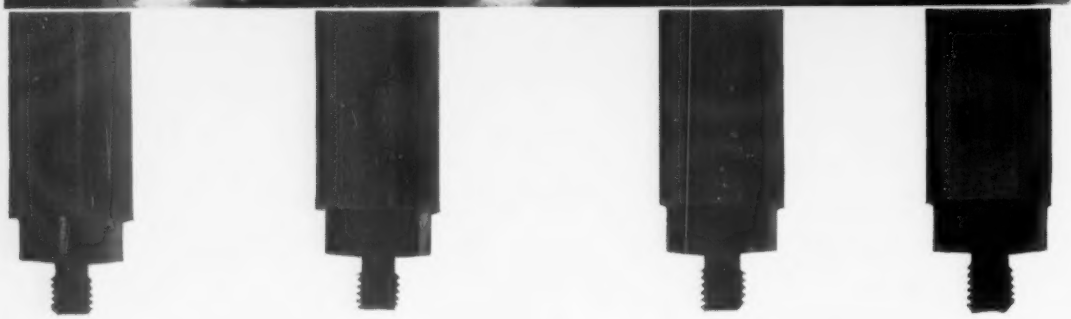

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ELECTRICAL TIMES

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Dans ce numéro

Circulation d'air dans les Machines Electriques ... 82
Les circuits d'air des machines électriques sont une combinaison de canalisations en série et en parallèle, et l'on peut les considérer comme analogues à des circuits électriques résistifs. A partir de cette analogie, l'auteur développe des formules mathématiques pour la circulation d'air, en considérant individuellement les variantes, dont on peut estimer approximativement les indices, de façon à donner un résultat global suffisament précis.

Nouvelle Centrale Nucléaire à Dungeness 87
Le CEGB a passé un contrat pour la huitième centrale nucléaire de Grande-Bretagne. Les travaux de construction d'une centrale à deux réacteurs de 550 MW commenceront à Dungeness au mois d'août. Elle sera du type refrodi au CO_2, "magnox" ralenti au graphite; et comportera huit chaudières fonctionnant à deux pressions 99 kg/cm² et 39 kg/cm². La vapeur haute pression sera amenée aux souffleurs entraînés par turbines; la vapeur à l'échappement sera amenée aux canalisations de basse pression après réchauffage à la température de départ de 391 °C.

Réparation des Lignes par Hélicoptères 94
De grosses chûtes de neige, dans le sud est de l'Angleterre, peuvent provoquer des ruptures de conducteur sur les lignes de 132 kV, et empêcher aux équipes de réparation d'utiliser les routes. Des essais recents, par mauvais temps, ont montré que l'on pouvait repérer facilement un conducteur brisé d'un hélicoptère volant le long de la ligne. On a préparé un plan de secours permettant d' amener assez d'hommes et d matériel par hélicoptère, pour réparer toute défactuosité possible, en trois voyage à partir du centre de réparation.

In dieser Nummer

Luftströmungswege durch elektrische Maschinen hindurch 82
Die zur Luftkühlung elektrischer Maschinen vorgesehenen Durchströmkanäle setzen sich aus hintereinander sowie parallel angeordneter Umlaufwege zusammen und können daher als analog den elektrischen Widerstandskreisen betrachtet werden. Von dieser Analogie ausgehend stellt der Verfasser mathematische Ausdrücke für die Luftströmung auf, indem er diejenige veränderlichen Elemente einzeln auseinandersetzt, deren Grösse sich annähernd feststellen lässt und somit zu einer einigermassen allgemeingültigen Berechnungsgrundlage gelangt.

Noch ein Atomkraftwerk 87
Der Auftrag zum Errichten des achten in Grossbritannien zur Aufstellung gelangenden Atomkraftwerks ist neulich von der britischen Elektrizitätsbehörde (CEGB) erteilt worden. Mit den Arbeiten wird im August dieses Jahres in Dungeness begonnen werden, wo das neue 550 MW leistende Werk mit zwei Kernreaktoren errichtet wird. Diese werden von der CO_2-gekühlter, graphitmoderierter Magnox-Bauart sein und acht Dampfkessel betreiben, die für zwei Dampfdrucke ausgelegt sind, nämlich 99 kg/cm und 39 kg/cm². Der hochgespannte Dampf wird den Turbinengebläsen zugeführt; hiervon wird der Abdampf auf die Anfangstemperatur (391° C) wiedererhitzt und sodann an die Niederdruck-Hauptleitungen abgegeben.

Hubschraubereinsatz bei Reparaturarbeiten an Freileitungen 94
Schwere Schneefälle in Südostengland können Leitungszusammenbrüche im 132 kV-Netz verursachen und ausserdem den Zugang für Rüstwagen und Mannschaften versperren. Kürzlich unternommene Versuchsflüge bei schlechtem Wetter haben den Beweis dafür gebracht, dass ein zusammengebrachener Starkstromleiter von einem der Strecke entlang fliegenden Hubschrauber aus leicht erkannt werden kann. Daraufhin ist ein Notstandsplan ausgearbeitet worden, der es ermöglichen soll, Monteure und Material von der Reparaturzentrale aus in drei Flügen an Ort und Stelle zu transportieren u. zw. in solcher Zahl bzw. Menge, dass jede zu gewärtigende Störung ungeachtet der Wetterlage behoben werden könnte.

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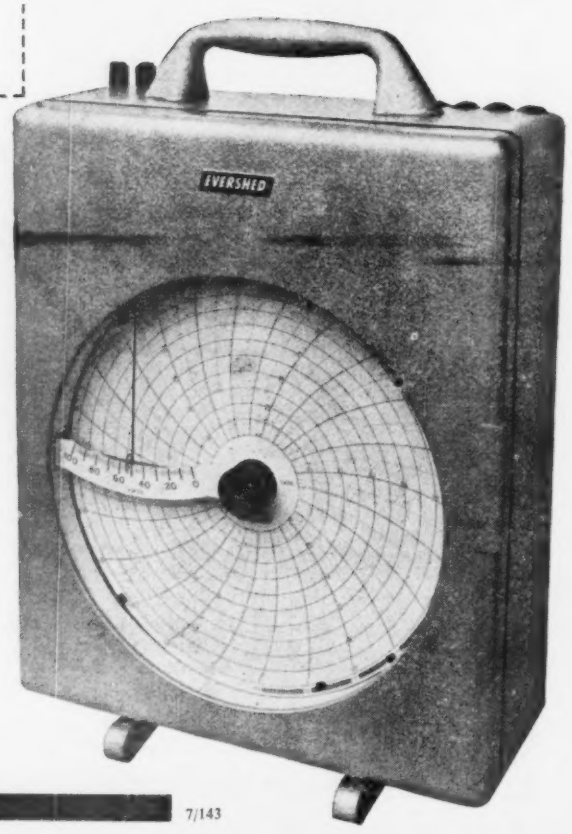

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ELECTRICAL
TIMES

ESTABLISHED 1891

THURSDAY, 21 JULY, 1960

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Comment

COST OF NUCLEAR RESEARCH

This week the news has been nuclear: the contract for Dungeness, the UKAEA annual report, and Sir Christopher Hinton's lecture at the Tercentenary Celebrations of the Royal Society. While the technical particulars of Dungeness show little more than the expected further step forward in the evolution of the now familiar CO_2-cooled graphite-moderated reactor, Sir Christopher, in his usual profound way, raises the fundamental question of how much of the nation's effort should be devoted to nuclear research. For how long can the electrical industry justify a research and development cost of 30% of the capital value of nuclear plant, he asks, while for conventional plant the figure is of the order of 5%? Further underlining the high development and research costs, he suggested that when the advanced gas-cooled reactor goes into service, expenditure on the Windscale prototype will have been of the order of £30 million, yet the number of stations of this type to be built by the CEGB is likely to be less than ten. Sir Christopher sets a limit to the continuance of this high intensity research. He suggests it should go on only to the point of breaking even with conventional plant, which will be at some time in the 1970's, by which time there will not be enough British-mined coal to meet CEGB requirements. Subsequently, research on reactor technology should be self-justifying by the savings which can be expected to arise from its industrial application. Few would quarrel with such a basis of assessment now that a substantial part of nuclear research is beginning to shake free from the uneconomic urgency associated with defence, but is Sir Christopher thinking too closely in terms of the CEGB needs? May not the number of stations in the divisor be greater by reason of increasing collaboration with Europe? The greatest shortcoming of the nuclear programme in the light of an easier fuel situation has not been the continuing postponement of the break-even date for CEGB stations, but the failure of the British consortia to find the overseas markets that were hoped for. Exports must be a factor in any calculations of British industrial effort.

SCIENCE FOR THE COMMON GOOD

The Royal Society has been fortunate in the men who have served it; it is particularly fortunate in the inspiring address by Sir Cyril Hinshelwood at the formal opening of the Tercentenary Celebrations this week. If justification for the existence of the Society were needed, it is to be found here, in the right conjunction which can garner the original thought and judgment of the individual

and provide a limited community, commanding prestige and confidence, able to mediate between the individual and the social group at large. But the Society must look forward also. Between the limits of catastrophe by overpopulation or nuclear destruction and the continued and accelerated progress of science on a curve sweeping upward at an ever faster rate, Sir Cyril foresaw a third solution with the curve levelling out or gently undulating. With the equations insoluble, one simple proposition was put forward, that the better equipped are certainly more likely to survive than those worse equipped. The task of the men of science is therefore to go ahead undeterred by any of the uncertainties. If social and moral problems are raised they are not new but part of an age-old drama. That is the message that Sir Cyril offers to all concerned with technical and scientific advancement; it is but a projection of the history of the Royal Society itself.

THINKING UNDERGROUND

There are signs that increasing thought is being given to the economical possibility of replacing overhead lines with underground cables. Not that anyone has any illusions that it is not going to cost more; the question is whether the price of cable and the cost of laying can be reduced to a point where the extra expense is justified by the increased reliability of service. In both Australia and the United States, recent experience in undergrounding of l.v. overhead distribution appears to have been considered worth while and at the recent BEPC Mr A. N. Irens visualised the use of undergrounding for primary distribution voltages of 11 kV and perhaps higher, and called for a thorough study of the problem. This week we publish a short description of a new petrol-driven trencher that is being introduced into this country, which will sell for under £1,000. At the present time these are only a few loose straws blowing in the wind, but what is significant is that they are all blowing in the same direction. Much study and experiment needs to be done before it can be asserted with confidence that extensive undergrounding is practical and imminent. New cables will be needed, and new laying techniques also. An assessment must be made of what features can be dispensed with, in the terminal equipment equally with the cable. Some of the spirit that led to the BS 1320 overhead line is required if a really significant advance is to be made.

THE MISSING LINK

It was in 1952 that the supply industry first approved in principle a link between France and England to exploit the differences in the load curves of the two countries. Now the contract for the interconnecting cables has been placed, the inverter equipment having already been ordered, and operation is scheduled for next year. Nine years is a long time for any scheme to come to fruition and in this case it underlines the difficulty of launching a project of great technical complexity and novelty, quite apart from economic factors, when agreement has to be secured at each stage between two participating countries. During this time the whole concept of the scheme has been changed. Originally, it was visualised as an a.c. link operating on three-phase 132 kV, with a maximum power flow in either direction of 100 MW. Now the power has been stepped up to 160 MW and two-wire d.c. is to be used, operating at 200 kV with the centre point earthed. Although the first submarine d.c. link at Gotland has been in operation for seven years, the Channel crossing presented special cable problems, not only because of the greater transmission distance, but also because of the heavier cables used and the greater depth in which they had to be laid, across a busy shipping lane where close consideration had to be given to the effect on magnetic field. The extensive tests, including laying trials, that have been carried out should assure success in what will be one of the significant installations of the world. It is coincidental that the order for this cable, the English termination of which is at Dungeness, should be placed in the same week as the acceptance of the tender for the 550 MW Dungeness nuclear power station.

THE FAMILY WASH

Some weeks ago we referred to a punched-card operated domestic washing machine, one which required only the selection of a card appropriate to the type of clothes to be washed, and the machine would do the rest. With such a washer on the German market, now comes news of efforts in the US to develop an electronic controlled washing machine. This appears to possess logic circuits, transistors and all the panoply of computer technology, all to carry out the family wash. The story goes, that with the wide variety of modern fabrics, of mixtures of naturals and synthetics and synthetics and naturals, so the wash and rinse cycles multiply until the poor housewife must call automation to her aid if she is to provide the family with "electronically" clean clothes. What the old fashioned washerwoman would have done with all these technicalities is unthinkable, but probably the clothes would have been just as clean. This new US suggestion comes at a time when few new ideas are being launched on the American domestic appliance market; it is another indication that manufacturers are turning to gadgetry as a sales aid in this competitive field. It is a case of going one better than the Joneses, for no one can attempt to justify the extra cost on a machine that operates on a load factor of 1% to 2%. Also the more complicated the controls, the more likely they are to go wrong; that is a lesson from industrial equipment that will have to be learnt in the domestic appliance field.

Meteor

This week's quick summary of electrical news faces advertisement page 16.

Earthing to regulation

SECTION 4 OF I.E.E. WIRING REGULATIONS IN PRACTICE

by E. J. Sutton,* M.I.E.E.

IN considering Section 4 of the IEE Wiring Regulations, it is worth while referring to the Electricity Supply Regulations (1937), with particular reference to Regulation No. 26. This is, in effect, the only statutory requirement upon which the electricity authority can refuse to connect the supply. As it is of so much importance it is well worth while repeating it in full.

> The undertakers shall not permanently connect a consumer's installation with their electric lines unless they are reasonably satisfied that the connection, if made, would not cause a leakage from the consumer's installation exceeding 1/10,000 part of the maximum current to be supplied to the said installation.

This regulation is quite specific in its requirement and is probably the only one uniformly applied so far as the nationalised supply industry is concerned, in relation to the connection of new installations to their distribution networks. Other regulations are of the "permissive" type and, in the past, have been applied in different ways and to varying extent by individual area boards, although some considerable progress has been made towards more uniformity with respect to the requirements to be satisfied before the supply is connected to a new installation.

Danger

Bearing in mind the necessity to restrict earth-leakage currents, the first regulation of section 4 is one of the most important of the IEE Wiring Regulations; it itemises the four fundamental categories under which all electrical apparatus must be classified in order that it may be protected against dangerous earth-leakage currents.

Reg. 401—Protection against earth-leakage. Each of the four categories mentioned above is contained in a separate sub-clause to this regulation and the requirements for protection against dangerous earth-leakage currents may be summarised as follows:

(i) All-insulated construction.

(ii) Double insulation.

(iii) Earthing of exposed metal.

(iv) Isolation of metal parts from live parts or from earthed metal (per Regulation 403).

Reg. 402—Metalwork to be earthed. Where metal parts require to be earthed in accordance with 401 (iii) above, this regulation details the requirements for ensuring adequate and effective bonding to earth. Particular emphasis is placed on the use of the word "all" in sub-clause (A), as certain items associated with wiring systems very often get overlooked. Amongst the most common omissions are metal switchboxes and catenary wires, where overhead wiring is installed. Unless insulated lugs are fitted to the metal switchbox, the metal screws fixing the coverplate are usually still exposed, and must therefore be insulated from earth. Obviously the easiest solution to the whole problem is, at all times, to bond the earth-continuity conductor to the switchbox where sheathed wiring systems are used.

Although Regulation 403 (iii) permits the use of "short isolated lengths" of catenary wire to be exempted from earthing, the difficulty arises in assessing the term "short." It is, therefore, advisable to bond all catenary suspension wires to the earth-continuity conductor.

Before leaving this regulation, reference should also be made to sub-clause (D) and to the necessity for earthing one point of the secondary winding of a step-down transformer and all metal enclosures of the transformer, except where provided under the exemptions to this sub-clause. It is, unfortunately, a very common fault to find that the bell transformer connected to a domestic wiring installation has no bonding to the transformer enclosure or to the secondary winding.

Isolation and Bonding

Reg. 403—Isolation. Mention has already been made of the precautions to be observed in connection with the bonding of metal switchboxes under sub-clause (v) of this Regulation.

Attention is also drawn to sub-clauses (viii) and (ix) concerned with the earthing of metal suspension chains, suspension rods and complete lighting fixtures or fittings. Sub-clause (ix) requires that lighting fixtures and fittings must be earthed where they may be touched by a person in contact with other earthed metal or with a semi-conducting material (this means a concrete or tiled floor or wall surface). It is almost impossible to guarantee that any part of a domestic wiring installation will at all times remain "earth free," because there may be subsequent addition of central heating systems, or portable appliances which may be plugged into socket-outlets and which may have an outside earthed metal enclosure, as well as radio, record players and television sets which invariably require an earth connection. It is usually necessary, and at all times advisable, to connect the earth-continuity conductor to any exposed metalwork on lighting fixtures and fittings. This applies particularly to wall-mounted and bracket type lighting fittings.

It is a relatively expensive matter for the contractor to install a separate earth-continuity conductor to such positions after the sheathed wiring installation has been installed, and there is substantial justification for installing all sheathed wiring systems with an integral earth-continuity conductor contained within the sheath of the cable feeding all outlet and control positions.

Reg. 404—Additional precautions near water pipes, etc. Reference has already been made, under the comments on Regulation 214, to the requirements for the bonding of the earth-continuity conductor to other service pipes where there is a likelihood of contact between the services, or where separation cannot be made practicable. The

* Mr Sutton is Chief Technical Officer, NICEIC. His previous articles in this series were published in the ELECTRICAL TIMES, 11 February, p. 201; 18 February, p. 263; and 7 April, p. 562.

need for such bonding is illustrated in Fig. 1 (and in Fig. 10 of the first article in the series). Needless to say Fig. 1 shows how *not* to do this simple job as well as showing a breach of Regulation 207(G)!

This regulation should be carefully studied in detail by the student, so that, in these circumstances, he is fully aware of the additional metalwork requiring to be bonded to the earth-continuity conductor.

Fig. 1. Pipes for various services running close together, showing need for bonding

Reference should also be made to the Code of Practice for Farm and Horticultural Electrical Installations, C.P. 325. Lack of knowledge of this Regulation and of this Code has, in the past, led to fatal accidents and resulted in serious losses of valuable farm stock.

Bathrooms

Reg 405—Additional requirements in a room containing a bath. This is another regulation about which the student should be fully conversant and fully instructed. Under Regulation 303, mention has already been made of the necessity for fitting all lampholders with protective skirts, so that it is quite impossible to make contact with the live parts of the lampholder when removing or replacing a lamp. This point is again covered in sub-clause (A) of this regulation.

The requirements of sub-clause (B) are by no means taken as seriously as necessity demands. This subject has been dealt with to some extent under Regulation 314, where attention was drawn to the proper location of control switches in a bathroom.

The same requirements apply to the location of immersion heater controls, thermostats and the immersion heater head itself where this is located in the tank either within the bathroom itself, or within an airing cupboard located within the bathroom. All such equipment must be out of reach of a person in contact with the bath, and the generally accepted minimum distance is six feet.

Sub-clause (C) of this regulation states "No provision shall be made for the use of portable appliances." This sub-clause has been quoted in full as it is of the utmost importance, having regard to the safety of the user of the installation. Even though a socket-outlet may be specified by the architect, client or customer, the contractor should at all times refuse to install any provision for the plugging-in of portable appliances or apparatus.

The only exemption applies to the installation of a purpose-made supply unit for the connection of an electric dry shaver. Such purpose-made unit must comply with BS 3052 and, where such a unit is installed, it must be located in a position out of reach of a person in contact with a fixed bath. As already indicated, this means not less than six feet between the bath and the shaver supply unit.

It is sometimes required that a fixed appliance be installed in a room containing a bath; the connections to such equipment should be made through a switched and fused spur box, and in accordance with Regulation 314(B)(iii). A socket-outlet may not be used for this purpose unless it is located in a position where it is out of reach of a person in contact with the bath (and this includes a person standing on the edge of the bath), where it would not normally be possible to use such a socket-outlet for the connection of a portable appliance.

Where such fixed appliances are installed in a room containing a bath, the requirements of Regulation 404 must also be observed.

Basic Requirements

Reg. 406—Basic requirements for earthing. Since the safe use of an installation depends upon the proper operation of the protective devices, i.e., fuses or circuit-breakers, it is essential that any low-impedance fault between the live conductor and any adjacent exposed metal can produce a current that will operate these protective devices.

It is a fundamental requirement therefore that the earthing arrangement, which includes the main earth lead and the earth-continuity conductor, or path between the main earth terminal and the adjacent exposed metal, shall be so installed that its overall impedance does not exceed one ohm (see also Note to Regulation 407). As an alternative to fuse or overload circuit-breaker protection, an earth-leakage circuit-breaker may be used and all such equipment must be installed in accordance with Regulation 410, upon which further comment will be made later.

These basic requirements for earthing apply not only to all new complete installations, but also to extensions, even minor extensions of one outlet only, to existing installations. It is the National Inspection Council's experience that insufficient attention is paid by contractors and their staff to the checking of existing earthing arrangements, when adding extensions to installations. This means not only a visual check of the existing main earth connections, but also carrying out the appropriate tests as defined in Section 5 of the Regulations.

In most areas of the country the electricity boards will, upon application being made to them, provide an earthing terminal or connection, unless their system of distribution feeding the installation renders this impracticable. With the increasing unreliability of the main water systems as an earth return path, there is no doubt at all that these facilities provided by the electricity boards are invaluable, and should at all times be used by an electrical installation contractor wherever possible.

Reg. 407—Earth-continuity conductors. Although the main earth terminal may be provided by an electricity board, the responsibility for the proper earthing of all parts of the electrical installation rests entirely with the electrical installation contractor. It is therefore essential that a careful study is made of this regulation to make sure that, not only is there a low-impedance earth-continuity path throughout the wiring installation, but that it is of adequate size, or cross-sectional area, so as to permit the passage of three times the rating of the protective fuse or one-and-a-half times the setting of the overload circuit-breaker protecting the circuit. If the wiring installation is enclosed in metal conduit,

trunking or ducts, a careful check should be made at all junctions or joints in the system to make sure there are no loose connections. This applies particularly where individual conduits are connected by bushed entries to the main system. Care should also be exercised during the erection period to prevent subsequent corrosion at junction points or joints in the metal enclosures and suitable protective measures taken, e.g., painting of all exposed joints on a conduit system.

Earth Connections

Reg. 408—Earthing leads. Mention has already been made of the necessity of providing adequate cross-sectional area of earth-continuity conductors throughout the installation. It is just as essential to ensure that the main earth connection of the complete installation shall be of cross-sectional area or size, in accordance with Table 6 of the Regulations, and to ensure that such main earth connection is properly protected throughout its length of run.

The connection to the earth electrode must be made readily accessible so that it can at all times be checked and maintained in efficient order.

Reference to BS 951 is well worth while, to find out which is the proper type of clamp to use for making these main earth connections.

Reg. 409—Methods of earthing. Sub-clauses (A) and (B) of this regulation clearly indicate the methods of earthing which may be provided by the electricity board as the supply undertaking, and should always be used wherever possible. Where it is necessary for the electrical installation contractor to provide the main earth electrode, study carefully the requirements of sub-clause (C) of this regulation, with particular reference to the note attached thereto. Where a main water pipe is used make sure, by testing, that it will in fact provide an effective earth connection, and check with the water supply authority that the service connection is mechanically and electrically continuous to the service main.

E.L.C.B's

Reg. 410—Earth-leakage circuit-breakers. It is not always possible, particularly in rural areas, to obtain a sufficiently low-impedance path from the main earth electrode, through the mass of earth, back to the transformer earth-neutral connection. Under these circumstances, where insufficient fault current would flow to enable the protective devices to operate effectively, it is necessary to install one or more earth-leakage circuit-breakers to protect the installation and to prevent sustained and dangerous voltages developing under fault conditions (see Note 1 to Regulation 406). Sub-clause (B) of this regulation gives alternative methods of providing earth-leakage protection and Figs. 2 and 3 illustrate, by line diagrams, the voltage-operated and the differential current-balance types of earth-leakage circuit-breaker, respectively. (These diagrams have been taken from "The ASEE Guide" to the thirteenth edition of the IEE Wiring Regulations.)

When installing the earth electrode for the earth-leakage circuit-breaker, it is absolutely essential that it be positioned outside the resistance areas of parallel earth connections, or other earth electrodes connected to other earth-leakage circuit-breakers. Particular care is also essential where bonding between the installation earth-continuity conductor and any other service pipes or metalwork has been necessary to satisfy Regulation 404, as parallel earth paths can render the earth-leakage circuit-breaker completely inoperative.

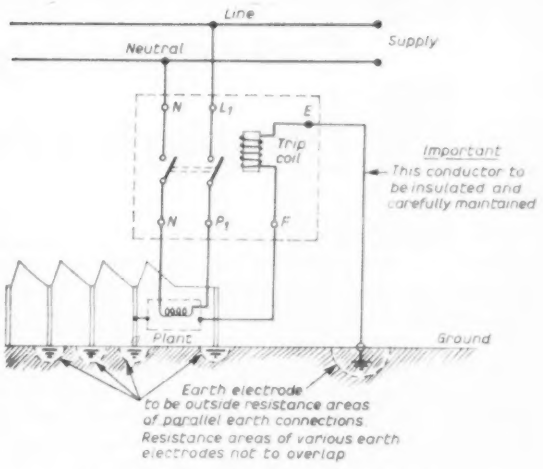


Fig. 2. Protection by voltage-operated e.l.c.b.

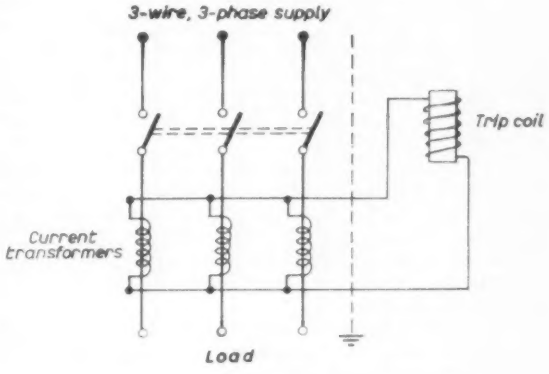


Fig. 3. Protection by differential current-balance e.l.c.b.

Conclusions

Because of the importance of earthing in the modern electrical installation, each one of the regulations in Section 4 has been commented on at some length. It has become increasingly obvious over the past few years that the number of wiring installations that can be carried out, and maintained indefinitely, under "earth free" conditions is very few in actual practice. The inevitable answer, therefore, is to ensure that all exposed metalwork associated with, or located immediately adjacent to, the electrical wiring installation, must be adequately bonded to the earth-continuity conductor throughout the system and connected solidly to the main earth terminal, earth electrode or earth-leakage circuit-breaker.

If one may be permitted to look ahead, future development may very well be that other services, such as water and gas, may require to be bonded effectively to the main earth terminal at the point of entry to any premises. By so doing, any attempt at segregation within the building becomes unnecessary, although bonding may require to be carried out to Regulation 404, where tests reveal that other service pipes may not have negligible impedance at possible points of contact. However, this is looking ahead and such bonding of all services at intake positions is not yet a requirement of the IEE Wiring Regulations.

(Series to be continued)

Calculating air flow through electrical machines

by J. L. Taylor, B.Sc. (Eng.), A.M.I.E.E.*

VENTILATION engineers are familiar with the calculation of pressure drops and the required duties of fans and blowers to pass air through ducts and airways; but the electrical engineer who requires cooling air for machines and apparatus is often in doubt how to determine the pressure associated with the air flow required. The analytical assessment of ventilation requirements is often avoided, when it is not essential to obtain an accurate forecast, because the mechanics of fluid flow are regarded by many who have not been directly associated with the subject as shrouded in mystery. If the most efficient and economical design of equipment is to be achieved, however, it becomes imperative to attempt a scientific design. Air pressure losses which are higher than necessary require larger ventilating fans, with larger motors if they are electrically driven, and there is consequent additional power wastage.

It is quite practicable, with only a limited knowledge of the subject specifically applied, to analyse a ventilation system and predetermine its loss characteristics with sufficient accuracy to give confidence in applying the calculated results to determine the most suitable fan for the purpose. This article gives the essential background for this type of analysis.

It is assumed that in all cases Reynolds' number is above the critical value for "streamline" flow and that the air flow is always "turbulent." So that

Pressure Drop = k × velocity head
h = kV.P.
Where h = in. water gauge
k = coefficient dependent on change of conditions of air flow.
V.P. = Velocity pressure in. w.g.

The resistance due to friction of air with contact surface is ignored, as it will be negligible compared to losses at changes of section, etc.

The velocity pressure is the static pressure equivalent to the energy in the moving air and

$V.P.=\left(\frac{V}{3970}\right)^2$ where V is in feet per minute and air is at NTP.

If the air flow is Q_1 cu ft/min through an area A sq ft,
$V=Q_1/A$
and then $V.P.=Q_1^2/(3970A)^2$
Using Q_1 in units of 1,000 c.f.m. = Q.
$V.P.=(1{,}000/3970)^2\times(Q/A)^2$ in. w.g.

The drop may be expressed conveniently with negligible inaccuracy to

$h=\frac{k}{16}\cdot\left(\frac{Q}{A}\right)^2$ in w.g. where: — Q = c.f.m./1000
A = Area in sq ft
Air at NTP.

The values of "k" associated with changes in conditions such as contractions, expansions, bends, etc., may be related to the velocity before the change or after the change and the area "A" used should be appropriate to the available value of "k" in each case. The appropriate area is indicated for the published value of "k," and must be carefully noted, as the effect of using an incorrect area can be considerable.

Example

Pressure drop across sudden expansion of an air duct.
Q = 4,000 c.f.m.
A_1 = 1 sq ft before expansion.
A_2 = 2 sq ft after expansion.
In this case k is affected by the ratio expansion

$k=\left(1-\frac{A_1}{A_2}\right)^2=(1-\tfrac{1}{2})^2=0{\cdot}25$ related to A_1

$\therefore h=\frac{{\cdot}25}{16}\times\left(\frac{4}{1}\right)^2=0{\cdot}25$ in. w.g.

Air circuits are a combination of series and parallel circuits, and may be considered directly analogous to electrical resistive circuits.

Air Flow Series Circuits

The total pressure drop over a circuit consisting of a number of changes in conditions but with a constant air flow through the circuit is the sum of the pressure drops along the circuit, and may be represented by a series of resistance drops as in Fig. 1.

$H=h_1+h_2+h_3+$ etc.
where $h=(k/16)\,(Q/A)^2$
Q = c.f.m./1000
A = Area in sq ft.
k = coefficient related to A.

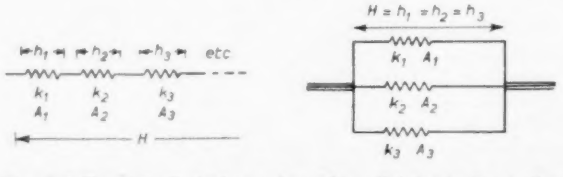
$$H=\frac{Q^2}{16}\left(\frac{k_1}{A_1^2}+\frac{k_2}{A_2^2}+\frac{k_3}{A_3^2},\text{ etc.}\right)$$
$$=K\frac{Q^2}{16}\text{ where }K=\frac{k_1}{A_1^2}+\frac{k_2}{A_2^2}+\frac{k_3}{A_3^2}+\text{etc.}$$

Air Flow in Parallel Circuits

For air flow in parallel circuits, the pressure drop across each section is the same as the drop across the whole, and the air flow Q will divide according to the resistance of each stream to achieve this balance. See Fig 2.

$$\text{so } h=\frac{k_1}{16}\times\frac{Q_1^2}{A_1^2}=\frac{k_2\cdot Q_2^2}{16\,A_2^2}=\frac{k_3\cdot Q_3^2}{16\,A_3^2}=\text{etc.}\ldots\ldots$$

where $Q_1+Q_2+Q_3+$etc. = Q, total air flow
and $A_1+A_2+A_3+$etc. = A, total area.



Figs. 1 (left) and 2. Equivalent series and parallel circuits for air flow

* Mr Taylor is with the English Electric Co., Bradford.

$$\therefore Q = \sqrt{16h}\left(\sqrt{\frac{A_1^2}{k_1}} + \sqrt{\frac{A_2^2}{k_2}} + \sqrt{\frac{A_3^2}{k_3}} + \text{etc.}\right)$$

$$= \sqrt{16h}\left(\frac{1}{\sqrt{K_1}} + \frac{1}{\sqrt{K_2}} + \frac{1}{\sqrt{K_3}} \text{ etc.}\right)$$

Usually it is known what air flow is required and the pressure drop is to be found.

$$h = K\frac{Q^2}{16} \text{ where } \frac{1}{\sqrt{K}} = \frac{1}{\sqrt{K_1}} + \frac{1}{\sqrt{K_2}} + \frac{1}{\sqrt{K_3}} \text{ etc.}$$

and $K_1 = \frac{k_1}{A_1^2}$ etc.

Take the example of an a.c. machine, assuming two parallel paths through the rotor and stator, as shown in Fig. 3.

The best approach is to find the equivalent effect of parallel rotor and stator, and then treat as a series circuit.

At (5) $k_5 = \left(1 - \frac{\cdot 25}{3}\right)^2 = 0{\cdot}84$

For (4), (5) and (6) in series.

Total $K = \frac{0{\cdot}8}{0{\cdot}25^2} + \frac{0.84}{0{\cdot}25^2} + \frac{1.0}{3^2} = 26{\cdot}31$

At (8) $k_8 = \left(1 - \frac{\cdot 2}{1{\cdot}5}\right)^2 = 0{\cdot}75$

For (7) and (8) in series.

Total $K = \frac{0{\cdot}8}{0{\cdot}2^2} + \frac{0{\cdot}75}{0{\cdot}2^2} = 38{\cdot}8$

For these two paths in parallel.

$$\frac{1}{\sqrt{K}} = \frac{1}{\sqrt{26{\cdot}31}} + \frac{1}{\sqrt{38{\cdot}8}} = \cdot 195 + \cdot 161 = \cdot 356$$

$\therefore K = 7{\cdot}9$

$K_1 = 0{\cdot}8/(1{\cdot}5)^2 = \cdot 355$

$K_2 = 0{\cdot}4/(1{\cdot}5)^2 = \cdot 178$

$K_3 = \quad 1/(1{\cdot}5)^2 = \cdot 445$

$K_9 = 0{\cdot}8/(1{\cdot}8)^2 = \cdot 247$

$K_{10} = \quad 1/(1{\cdot}2)^2 = \cdot 695$

Add K found above 7·90

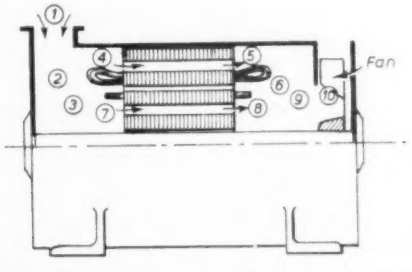
K total 9·82

Total drop $= 9{\cdot}82Q^2/16$

e.g. At 2,000 c.f.m. *Total Pressure Drop* $= 2{\cdot}45$ *in. w.g.*

Pressure Drop across Rotor (or Stator in parallel)

$$h = \frac{7{\cdot}9 \times 2^2}{16} = 1{\cdot}97 \text{ in. w.g.}$$



Elementary self-ventilated a.c machine (half section view)

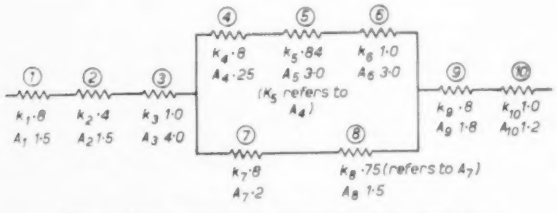


Fig. 3. A.C. motor having representative air flow circuit

1, Inlet duct to frame. 2, Sudden expansion inside frame from 1·5 sq ft to 4 sq ft. 3, Right-angled bend. 4, Contraction entering ducts. 5, Expansion leaving stator ducts. 6, Sharp bend of stator air. 7, Contraction entering rotor ducts. 8, Expansion leaving rotor ducts. 9, Orifice loss entering fan. 10, Right-angle bend

Q through Rotor $= \sqrt{\frac{16 \times h}{K}} = \sqrt{\frac{16 \times 1{\cdot}97}{38{\cdot}8}} = 0{\cdot}9$

$\therefore$ Rotor Air = 900 c.f.m.

Effect of Rotating Ducts

When the peripheral speed of rotating ducts is high compared to the nominal air speed through the duct it is probable that the increase in pressure drop at entry is noticeable, and it is advisable to check back the air flow through the ducts, and establish whether with a stationary rotor, the air velocity in the ducts would be low; then increase the particular value of "k" in the ratio:

$$(V^2 \text{ rotation} + V_{air}^2)/(V_{air})^2$$

and repeat the calculation through to see the effect. Strictly speaking this would cause a redistribution of the air flow, requiring a series of checks and recorrections, but the first correction gives the highest pressure drop and would probably be quite accurate enough.

Effect of Air Gaps

Although the cooling effect of the rotating surface in the air gap is considerable, the importance of including the air gap as a parallel path for pressure drop calculations will depend on the size of the gap, the entry and exit characteristics, and the surface condition of the armature and poles and the armature speed. It will often be negligible due to the small volume of air permitted to flow. If it is not included, the calculated pressure drop will be higher and will leave a margin in hand. This single part of the subject is very involved in itself and in the case of salient pole d.c. machines it is believed to be of minor effect compared with the alternative air paths available.

Example. A minimum reasonable value of "k" to allow for inlet and exit loss plus friction in the gap would be, say, 1·0.

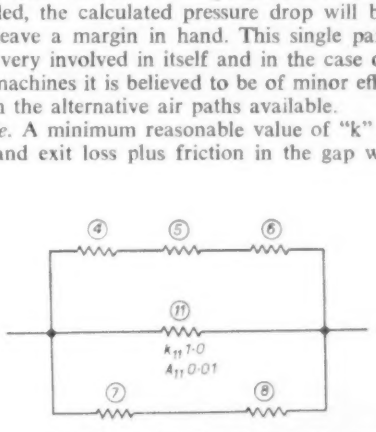


Fig. 4. Effect on calculations of including rotor air gap (compare Fig. 3)

In the previous example add this parallel path across the two already given (Fig. 4).

$K_{11} = 1{\cdot}0/{\cdot}0001 = 10{,}000$ which is very large.

It is immediately clear that unless the air gap is large enough to give a flow section which is a significant percentage of the alternative minimum paths through armature or field there is no point in allowing for it. The gap could, however, be significant in non-salient-pole systems, where it presented an alternative air path of comparable proportions.

Air Circuits of D.C. Machines

Due to the congestion through most types of machines, it is necessary to watch carefully for obstructions in the air stream which might be significant, and if these cannot be removed (which is often the case) they must be allowed for in the calculations. The type of obstruction is often of such a shape and position that a reliable value of loss coefficient would not be found in any tables, but the most important thing is to recognise the type of the interference

with uniform flow and a reasonable allowance can be made from inspection, by interpolation or deduction from published figures in ventilation engineering reference books for simpler duct systems.

The usual things to watch for are:

Entry to Machine. Area may be small, giving high velocity pressure with a high-loss opening such as "sudden contraction," or "sharp-edged orifice."

Brushgear obstructing entry.

Brushgear rocker ring partially obstructing air inlet.

Cables and connections to brushgear occasionally require taking into account.

Overhung generator on main generator. This machine when fitted is arranged so that its cooling air forms a part of the main generator cooling air. The overhung generator would then be calculated first and considered in parallel with the other air intakes.

Changes in direction of air on leaving the air entry, entering the commutator ducts, and leaving the windings, for example.

Value of Calculation

It must not be expected that micro-accuracy will be achieved in this type of design calculation. The value in making the calculation lies in dividing the air circuit into a number of elements which can be estimated either accurately or with reasonable approximation, giving reasonable accuracy as a combination. It should be realised that great accuracy is not necessary, as the ultimate requirement is mass air flow, and quite considerable errors may be incurred in the calculated pressure with much less effect on the air volume flow, as the head loss is proportional to square of volume flow.

For instance a 10% underestimated head would result in only about 4½% reduction in air volume if only the calculated pressure head were available. In addition, the characteristic of the fan and its motor often help to reduce the error in the case of force-ventilated machines.

References

Many useful values for "k" can be found directly or interpolated from text books on ventilation. Fan manufacturers are usually able to provide the standard data and advise on its adaptation. A useful summary is available in Wood's "Practical Guide to Fan Engineering" (pages 80-81).

Special acknowledgement is made to the article entitled "Design of Fans for Cooling Electrical Machines", by R. Poole, Esq. (published through the Association of Engineering and Shipbuilding Draughtsmen by Draughtsman Publishing Company in 1932-33), which prompted the selection of this subject as worthy of wider recognition by design engineers.

Acknowledgement is also made to the English Electric Co. Ltd., for permitting publication of this article.

A Lightweight Cable Trencher

A TRENCHING machine, capable of cutting trenches 3 to 12 in. wide, 5 ft 6 in. to 2 ft 6 in. deep, yet costing under £1,000 and weighing only 12 cwt, is a tool that many mains engineers and others concerned with "undergrounding" must often have dreamed about. Last week the first of the Model 3/12 trenchers to be introduced by John Allen and Sons (Oxford) Ltd. was demonstrated before a critical audience and came through with flying colours.

Views of the 3/12 Allen cable trenching machine

Powered by a 12½ h.p. air-cooled four-stroke engine and with simple, easily mastered controls, the belt-driven digging chain rapidly cut a clean 4 in. wide trench, 5 ft deep and ideal for taking an electric cable, at the rate of 12 ft per minute. The spoil from the trench was neatly piled to the left of the trench by a spiral auger, ready for reinstatement, the right-hand side being kept clear by a sweep blade. Afterwards the spoil was returned to the trench by a specially designed backfiller blade which had been attached to the digging boom in a few moments.

The overall height and width of this attractive looking tool is only 37 in. and the length to the end of the boom, 6 ft 4½ in. Despite its compact and almost toy-like appearance, the construction is quite rugged and it will stand up to hard knocks, the drive mechanism being a one-piece unit with hardened gears and heavy bearings throughout. Drive to the tracks is hydraulic through a two-speed reduction unit with independent drive clutches for steering, the higher speed being for travelling or bull-dozing at a rate of up to 2 m.p.h. Weight distribution on the tracks is 3·3 lb/sq in., which enables the trencher to be used on soft grounds without sinking or bogging.

Control

Coupling between the motor and the drive unit is hydraulic, regulated partly by adjustment of the engine throttle and partly by a by-pass valve. Instantaneous reversal of the trencher direction is effected by a lever which reverses the flow of oil between the pump and the drive-unit. Hydraulic power is also used for raising and lowering the boom.

The model demonstrated is of recent American design and deliveries from USA production will commence in a few weeks' time. Ultimately the trencher will be made at Oxford by John Allen and Sons.

Readers Views

Correspondents writing under pseudonyms are asked to submit their names and addresses in confidence to the Editor

"How Deep is Deep-freeze?"

UNDER the above heading, Meteor comments upon a letter to the *Financial Times* from Mr Saunders, of Kelvinator, criticising the attitude of importers towards deep-freeze compartments in refrigerators. In "Frimatic" refrigerators, which we import from France, the air temperature in the freezer can be reduced to as low as 0°F; more than satisfactory for frozen foods.

The freezer is fitted with an insulated door and base, which ensures that the main cabinet is ideal for all other foods, including eggs and liquids.

E. H. Maltby,
JOINT MANAGING DIRECTOR,
EDMUNDSONS ELECTRIC CO. LTD.,
LONDON, S.W.9.

Unsatisfactory Wiring

I WAS interested in Mr D. S. Legg's comments on unsatisfactory wiring (Readers' Views, 26 May) also Mr L. C. Penwill's comments (23 June, 1960). I agree with Mr Penwill on adequate supervision being essential at all stages of an electrical installation and also a thorough testing before the supply authority is called upon to connect. Not all contractors do this, especially on domestic installations.

It would be intestesting to know what kind of installation inspector passed an installation as hopeless as that described by Mr Legg. Perhaps it was the type some area boards employ, where the so-called installation inspector only puts the service fuse in and seals up, and counts the number of light points, socket-outlets, etc.—all without very much inspection or testing—and hopes for the best.

One cannot but agree with Mr Legg that a much closer inspection and testing as carried out by professionals is necessary.

A. Dearden,
WINDHOEK,
SOUTH WEST AFRICA.

Terminals for Aluminium

DURING the last two days I have twice heard it expressed that anarchy in the Congo will not affect copper supplies to this country, because we are dependent on Rhodesia for our copper. This is surely nonsense! The Belgian Congo ranks fifth among the countries producing copper in the free world, behind the USA, Chile, Rhodesia and Canada in that order. It produces about 250,000 tons per annum, chiefly in electrolytic copper, and nearly all of it is sold in Antwerp at prices based on the LME quotations, and it is used in the Common Market countries. A stoppage of deliveries to Antwerp from the Congo would inevitably increase the pressure on the London market, and would inevitably mean higher prices.

To electrical engineers a higher price for copper means more expensive cables. Particularly are the costs of heavy power cables affected, with their high copper content. It is generally understood that at today's copper prices power cables with aluminium conductors are much cheaper than copper cables; and the higher the price of copper goes, the greater is going to be that saving. It is my experience that one of the main reasons why users, who know that aluminium cables would save them money, often continue to use copper is that the terminals in their electrical equipment are too small to take aluminium. Aluminium terminations are necessarily somewhat larger than their copper equivalents; it is a common complaint for electrical equipment to have skimpy terminals and cramped space for incoming leads, even for minimum size copper cables. If a design is cramped for copper, it may be completely unsatisfactory for aluminium. In practice it is often the case that if a manufacturer of switchgear spent a few shillings in providing more liberal accommodation in this equipment for cable entry and terminations, he would make it possible for the purchaser and user to save himself perhaps several hundreds of pounds by using aluminium connections.

Would it not seem to be a good time for the manufacturers of switchgear and equipment to reconsider the terminals in all their products, so that the purchaser may be free to use either copper or aluminium cables? All that is required is adequate dimensions, firm contact surfaces and thick washers (preferably plated), and pressure plates under grub screws in tunnel type terminals. All that is required, in short, is the abandonment of designs, which are not very satisfactory with copper though good enough to get by under ordinary conditions of loading.

A terminal that is satisfactory for an aluminium conductor will always be more than adequate for copper; the reverse is not always true. A manufacturer offering universal type terminals, therefore, can only offer an improved product—there is a lot to gain, and nothing to lose. Users should demand equipment with universal terminals.

F. G. McDonald, M.I.E.E.
ALCAN (UK) LTD.,
LONDON, W.1.

Crimped Terminations

REFERRING to the note on crimped terminations on page 15 of your issue of 7 July, we offer a type of cable lug which is crimped so as to obtain in the finished joint the desirable features to which you have drawn attention, i.e., control over lateral extrusion, and a minimum spread of the crimping barrel so that its end shall be as little greater as possible than the diameter of the cable insulation. In some cases where there is heavy insulation, the joint is in fact smaller.

In this case both impressions are effected in one crimping operation, producing two hexagonal bands with a bead between them. A section along the joint would appear exactly as illustration (b) in your article.

Cable lugs of this type and appropriate crimping equipment and dies, have been produced and applied successfully for many years.

C. T. Marx,
DIRECTOR,
ERMA LTD., WEMBLEY, MIDDX.

Training Wiremen. Revision of City and Guilds courses in electrical installation work has recently been completed. Existing B and C courses are retained largely unaltered, although syllabuses have been brought up to date. A new practical craft course A has been developed to encourage students joining the contracting industry straight from secondary modern school.

Nuclear progress in 1959

MAJOR EFFORT FOR CIVIL STATIONS MAINTAINED

CONTINUING maximum support for the civil nuclear generation programme and the completion of major projects for the defence programme set the pace of nuclear progress and expansion outlined in the annual report of the UKAEA laid before Parliament last Thursday.

During the year the remaining three reactors at Chapelcross were commissioned. The Authority now has four reactors at Calder Hall and a further four at Chapelcross providing plutonium and generating electricity.

Since their initial commissioning, the thermal output of the Calder Hall reactors has been raised by 15% above design capacity, but reblading of the turbines will be necessary to make this extra power available electrically. It is worthy of note that the output of Chapelcross now corresponds to 20% of the base load requirements of the South of Scotland Electricity Board and about 300 MW is being supplied to the grid by nuclear stations.

Improvements in operating techniques have increased the availability of reactors. By replanning charge and discharge schedules, a 50% reduction in scheduled shut-down time has been achieved, raising the reactor availability to 80%, an important feature for base load operation.

Fuel Development

A vital part of the Authority's contribution to the civil station programme is work on nuclear fuels and methods of canning. Development programmes are directed at obtaining maximum reliability with lowest possible generating cost for the Magnox stations, that is stations using uranium fuel canned in magnesium alloy. Although cost of power generated by the earlier Magnox stations is higher than in the latest design of coal-fired stations, there still remains scope for reduction in generation costs by improved design techniques. Trials on the Calder Hall and Chapelcross stations, for example, show that fuel operating temperature can be raised without loss of reliability and indicate that a rise of 20°C should be practicable above the original temperature of 408°C.

Since Calder Hall and Chapelcross were brought into service, nearly 200,000 fuel elements have been loaded and irradiated. These elements provide a statistically sound basis for assessing reliability and show a failure rate well below 0·1%. A programme of fuel element testing for the civil stations is in hand and has so far revealed some faults occurring in the initial stages of design, such as excessive vibration experienced in the coolant gas stream.

One of the Calder Hall reactors is being used to investigate problems of fuel burn-up associated with a requirement for civil stations of ensuring a heat content of 3,000 MWD/tonne. By March this year some of these channels had achieved 700 MWD/tonne while a few fuel elements had achieved 2,000 MWD/tonne.

Fuel charges for the CEGB and SSEB reactors amount to between 250 and 400 tonnes per reactor and are valued at between £5 million and £8 million. Annual rate of fuel replacement in these reactors is expected to be from one-fifth to one-quarter per year. For these reactors, and possibly for overseas contracts, the Authority will be supplying several thousand tonnes of uranium per year. Even so, slowing down of the nuclear power programme means that, for some years, the Authority's uranium stocks will exceed their requirements, because of existing contract commitments.

Considerable progress is reported in the preparation of nuclear fuels. Improvements to techniques are resulting in a 30% increase in output from the raw materials with a reduction in effluent of some 15%. Attention is being given to disposal of the increased effluent which will result from commissioning of civil stations. Although this problem is unlikely to be of importance for ten years or more, present methods of storing radioactive waste in sealed tanks may well give way to preliminary storage for a year or so, followed by concentration of the waste materials in a glass-like material with subsequent storing perhaps for more than 100 years.

High Temperature Reactors

Progress on the AGR was described in the ELECTRICAL TIMES for 9 June. This type of reactor may well be usable for civil power stations in the late sixties. Use of enriched fuel, smaller core and higher operating temperatures will enable capital cost reductions over the Magnox type.

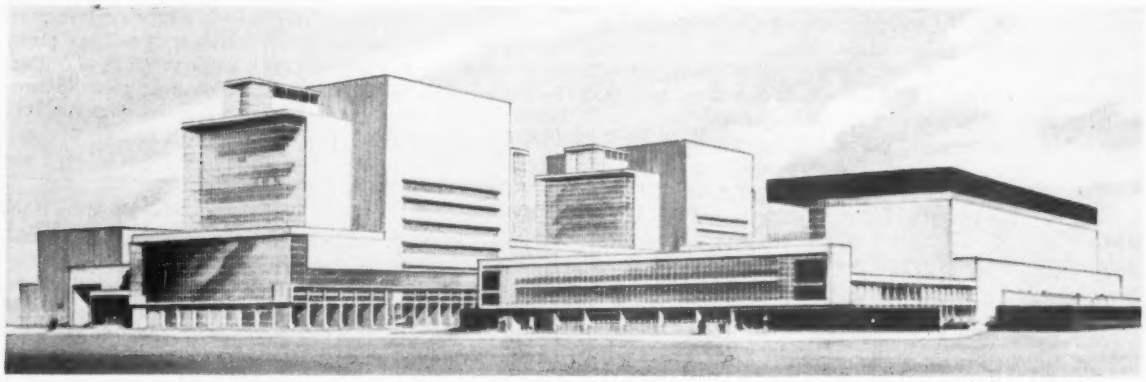
Subsequent development will depend on performance of advanced breeder reactors of the Dounreay type. The Dounreay reactor became critical in November, 1959, and is now gradually being worked up to full output. A prototype power producing reactor of this type may be built for operation about 1967.

High temperature gas-cooled reactors like Dounreay have higher heat ratings and gas temperatures than AGR, achieved by using an all-ceramic fuel in a graphite can. Development work on a sufficiently impermeable graphite to prevent escape of fission products into the gas cooling stream was necessary. Such graphite is now available, but its performance under irradiation has yet to be proved.

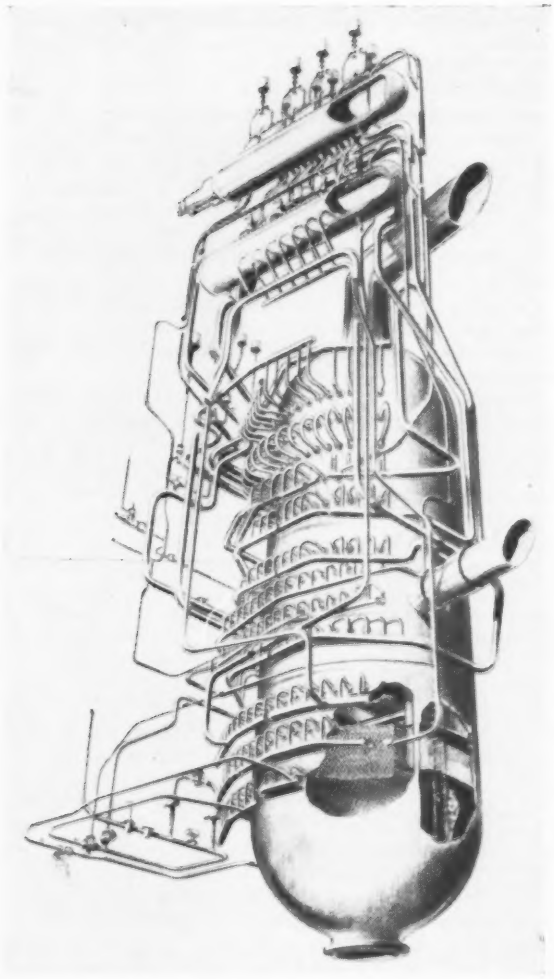
The proposal that a steam generating heavy water reactor (SGHW) should be constructed is under consideration by a study group. It is possible that steam would be generated directly in the reactor core thereby dispensing with external heat exchangers which have so far been a feature of many reactor designs.

The reactor may use water and steam coolant in pressure tubes inserted through a heavy water container. Preliminary experiments will be carried out in the Harwell DIMPLE heavy water thermal reactor.

Estimated net expenditure for the current year is 1% higher than the 1959-60 figure at £93·3 million. The commercial revenue during the year was almost £20 million, mainly from fuel elements for civil programmes, although there was also noteworthy increased sales of radioisotopes by 25% to £1·1 million.



Design for Dungeness



Design for one of the four fabricated J. Thompson boilers, with four sets of internal finned tubes, and showing external pipes

THE contract for Britain's eighth nuclear power station has been placed. The CEGB last week announced that for the Dungeness nuclear station the tender had been accepted of the Nuclear Power Group, the new organisation which combines the AEI-John Thompson and the Nuclear Power Plant consortia. This, it should be noted, is the first order in the second round of home nuclear stations. It is stated that the tender price was under £100/kW. Sir Christopher Hinton this week gave the all-in figure of £110/kW.

The 112-acre site, of which the station will occupy 40 acres, will be on the western side of Dungeness Point, built on shingle of no agricultural value, and the deep water of the English Channel is to hand to meet the requirements of 21¼ million gallons per hour. Official consent for the site was given by the Minister of Power in June, 1958. The station will have two identical reactors and a total output capacity of 550 MW.

The reactors will be of the familiar gas-cooled graphite-moderated type, working with natural uranium in Magnox cans. The design of each reactor will provide for a prism-shaped graphite core made up of large octagonal and small square bricks enclosed in a spherical steel pressure vessel and the usual concrete biological shield. Each reactor will be operated as an independent unit.

The dry CO_2 will circulate through the reactor at a pressure of 283 p.s.i.a. and for this purpose four blowers driven by back-pressure turbines will be used. Associated with each reactor will be four boilers—four to be produced by John Thompson. The boilers will generate steam at two pressures, 1,418 p.s.i.a. and 590 p.s.i.a.

The high-pressure steam will be used solely for driving the back-pressure turbines of the blowers. Exhaust steam from these back-pressure units will be returned to the boilers for reheating to approximately the original temperature of 735°F and then passed to the l.p. mains supplying the main turbines. The overall station efficiency operating under these conditions is put at 32·9%.

The turbine house will contain four 142·5 MW turbo-alternators, the turbines being made by C. A. Parsons, with AEI alternators. Both steam and electrical connections between the reactors and the turbine house will be taken through underground tunnels.

For the handling of the pressure vessel and the boilers a 400-ton Goliath crane will be used. It will be recalled that a Goliath crane was used on the Bradwell station being built by the Nuclear Power Plant Company, whereas at Berkeley other lifting means were adopted.

It is stated that work on site will commence during August, 1960, and the station is scheduled for commissioning in 1965. This will bring up the total of nuclear plant now under construction for the CEGB to 2,125 MW and at the present time the firms combined in this Nuclear Power Group have three other stations under construction: Berkeley, Bradwell and the Italian station, Latina.

TECHNICAL DATA

Net electrical output	550 MW
Heat output per reactor	835 MW
Efficiency	32·9%
Reactor gas bulk outlet temperature	770°F
Reactor gas inlet temperature	482°F
Nominal max. can surface temperature	828°F
Nominal max. uranium temperature	1,045°F
H.P. steam pressure at blower TSV	1,410 p.s.i.a.
H.P. steam temperature at blower TSV	738°F
L.P. steam pressure at main TSV	550 p.s.i.a.
L.P. steam temperature at main TSV	736°F
Feedwater temperature	356°F
LAYOUT:	
Distance between reactor building centres	426 ft
Length of reactor building	316 ft
Length of turbine house, only	385 ft
FUEL:	
Number of fuel channels per reactor	3,876
Number of elements per channel	7
Overall length of fuel element	41·7 in.
Dimensions of uranium rod	37·6×1·1 in. dia.
Total weight of uranium per reactor	298 tonnes
CORE DIMENSIONS:	
Diameter of active core	45 ft 4½ in.
Height of active core	24 ft
Diameter of reflector	50 ft
Height of reflector	27 ft 10 in.
Lattice (square) pitch	7·75 in.
GAS CIRCUIT:	
Mean diameter of reactor vessel	62 ft 6 in.
Reactor vessel general thickness	4 in.
Gas working pressure	283 p.s.i.a.
Number of gas circuits per reactor	4
Diameter of gas ducts	6 ft 6 in.
Power input per blower	7 MW
Overall height of boilers	75 ft
Internal diameter of boilers	23 ft 6 in.
Shell thickness (graded)	3¼ in. to 2⅞ in.
TURBO-ALTERNATORS:	
Continuous maximum rating	4×142·5 MW
Speed	1,500 r.p.m.
Generator voltage	13·8 kV
Vacuum	28·9 in. Hg.
Exhaust wetness	14·3%
Total circulating water quantity	353,000 g.p.m.

Channel cable contract placed

A CONTRACT for the British section of the cross-channel d.c. cable has been placed by the CEGB with AEI and BICC valued at £610,000. These two companies will manufacture and lay the British section of the cable, which extends 15 miles from the shore near Dungeness in Kent to the mid-point in the English Channel. From there the cable will be of French manufacture and contracts for this section will be placed by Electricité de France.

The cross-channel link will consist of two single-core cables each designed to carry 800 A at 100 kV to earth. The link will enable 160 MW to be transmitted between the two systems in either direction depending on the arrangements of the terminal inverter/converter stations.

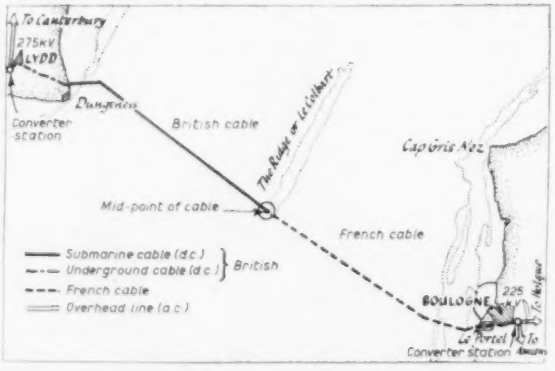
Cable Construction

The submarine cables will consist of a 0·525 sq in. conductor of stranded copper, lapped with an electrostatic screen. This will be covered by solid impregnated paper insulation, an external screen, a lead alloy sheath and armouring of 0·232 in. galvanised steel wire. Anti-twist tapes will be applied beneath the external serving to prevent damage to the cable under the severe tensions which may be necessary to lift it out of the sea bed sand if a fault should occur.

Inferior heat dissipating properties of soil compared with water require that the cross-section of the land connections be increased to 0·6 sq in. and to 0·925 sq in. where the cable passes through shingle. A section of the land cable will connect the submarine cable termination below high water mark to a link house. Another cable will connect the link house to the converter station at Lydd.

Sea trials confirmed the possibility of laying the two cables simultaneously, side by side, a condition necessary to ensure their magnetic fields do not interfere with ships compasses.

Overall cost of the project is estimated at £4·6 million. Because of the time difference in peak demand of the British and French systems the power transfers made possible by the cable will lead to generating plant economies in this country of about £8 million and a net annual saving of £250,000.



Route of the d.c. 200 kV, 160 MW link between the British 275 kV grid and the French 225 kV network. Differences in peak load periods on the two systems will enable considerable economies in generating plant, while a d.c. link makes synchronisation of the two systems unnecessary

AROUND THE TRADE

BY PEREGRIN

IT has been back to work with a vengeance since the delightful days of the ECA conference; for, while contracting is keeping its end up well, retailing has taken such a plunge that one is apt to have doubts of its recovery. Indeed, I hear that some of the older retailers, who had been creeping gently into retirement and leaving the worrying to the younger generation, have come out of their hidey-holes with a rush to administer artificial respiration. They all complain of being overstocked, particularly with refrigerators and washing machines, even after this lovely summer weather—which, by the way, has also taken a plunge.

The conference was excellent, with plenty of sunshine, strawberry teas and all. And, surely, we have never had a more interesting talk and more rewarding discussion than the morning we sat enthralled by Mr Nicholas Stacey's eloquent tongue, backed by a good deal of common sense and a very complete picture of the trials, difficulties and compensations which the retailer meets today. If complaint there was, it was only that the "get together" was either misnamed or badly conceived. The general impression of the rather diffident newcomers is that it is no-one's job to do the mixing and one may easily sit alone. The president and his lady did make a complete circuit, greeting all their guests, but what of the vice-presidents?

They remain unsung, unheralded, etc., except in their own branches, until they reach the throne. This is wrong: the members should know something of the men (and their ladies) who will one day occupy the highest position in the association.

Who Decides the Installation?

I see that Miss George has commented on my notes on "Viewpoint." I agree with so much that she has said—even that "faced with the choice between 8 in. and 6¼ in. plates" the 8 in. were preferred. My point is that members did not want that choice; they wanted both sizes to be available. Incidentally, Miss George has not answered my query as to how she will satisfy those users who want extra wiring or fuller information on appliances (which doubtless they will wish to purchase) in their own home.

Arising out of all this, however, is the age-old question as to who are the real experts to advise on electrical installations—the architects, the builders, or the electrical contractors? And what constitutes a first-class installation within the limits of the customer's purse? We know, or should know, the ideal, but determining what parts are sheer necessity, comparative comfort, or the height of luxury is something on which we often fall down. The builder's ideas seem governed by financial restrictions only, although to his one-light-one-switch he now adds one outlet on the landing for the vacuum cleaner and one in the living room for the television. What governs the architect I do not know, but his electrical installation does not appear to keep pace with the many improvements in modern building—the electrical consultant seems a rarity on a small installation. But what are electrical contractors doing to combat all this?

Do they take the view that they must not criticise, or improve on, what the architect, builder or owner wants in case they lose the job on price? It is unfortunate that the owner rarely realises the shortcomings of his installation until he starts to use it.

But, even so, to find in a new house in these enlightened days a single point in a bedroom, without even two-way control, astounds me. Could it be that the ECA requires to widen its field and give some of its members ideas on how to plan for the work it is so willing to guarantee?

Fair Trading

What a pity it is to see the long, lingering death of the Fair Trading Council, neglected by all who made it possible and who waxed fat under the shadow of its wings. We know that the Restrictive Practices Act makes it impossible for it to function on the same lines as before, but there is no doubt it puts a brake on malpractice and helps in ensuring a fair margin for all. Its triumphs have far outweighed its failures and I only hope that all sections of the industry will examine this problem in an intelligent way, thoroughly determined to find some reasonable substitute which can carry on by gentleman's acceptance (I dare not say agreement) the good work of keeping out cut-throat competition with its consequent lowering of service to the public and its elimination of the standards of decent trading.

I see that the organisers of the Electrical Fair, which was to be held at Alexandra Palace, have decided to postpone it until they can find a more central venue in London. I hope such a home will soon be found for it so that the domestic appliance trade can have a real show of its own. It will certainly be a help to view and appraise the merits of the far too numerous conceptions of our wide range of domestic appliances.

Incidentally, it could be that the demise of the Fair Trading Council would soon cut this number. It has happened in Canada, it could happen here. If cut-throat competition—the alternative to fair price maintenance—obtains, prices must come down all round.

Refinements in design may give way to cheap embellishments; and stock patterns which can be repeated *ad infinitum* will matter more than price with or without that added refinement. The retailer who survives will do so because of that "little extra" that he can wring from the manufacturer; for as the pattern of retailing changes so does the pattern of customer reaction, and service goes by the board in any rat race. One possible result would be that foreign appliances would stand a better chance than they do at present. Specialising by large retailers and chosen agencies could ensure that prices could not be affected by comparison and the "difference" of the goods would attract. At the moment, many trades are considering co-operative buying to obtain the extra discount to compete with the electricity boards. That is all right as far as it goes, but in Canada price fixing between a group of traders has just involved each participant in heavy fines. It could happen here.

Let us hope some action can be taken before we reach that stage. I suggest BEAMA, with the lesser stars EWF, ECA, ELFA, and so on, get together before the Fair Trading Council dies its unnatural death, with no flowers, by order of the Registrar of Restrictive Practices.

OVERSEAS NEWS

from our correspondents abroad

CANADA

Resale Price Bill

Regret that the Canadian Government had not revised its whole philosophy on business combines has been expressed in a brief submitted by the Canadian Electrical Manufacturers' Association to the Commons Committee on banking and commerce, which is studying proposed amendments to the combines law. The association supports proposals which, in effect, softens the approach of the law to "beneficial" combines, but argued that they do not go far enough. The association would like to see the Combine Act changed so that no company could be convicted unless its action was proved to be "to the detriment or the interest of the public." They believe that a manufacturer should be permitted, if he wishes to do so, to exercise sufficient control over the selling prices of his trade-marked products to protect retailers handling his line from loss-leader attacks and other unfair trade practices. But the Government's proposed amendments would have little or no effect on prices, the association maintain. Under the amendments, the selling prices of the loss-leaders could be expected to increase, but other products and services sold by the same dealers would no longer have to subsidise the loss-leader items. Resale price maintenance was banned in Canada in 1951. The present Bill does not rescind the ban, but it would permit manufacturers to withhold their products from retailers who sold their branded products at a loss for promotional purposes.

Another Peace Proposal

The latest broadside of the Peace River Power Development Co., intended to increase support for its own proposals, is a special engineering study which suggests integration of the Peace and Columbia power projects as part of a Pacific north west power pool. The study has been prepared by Mr R. L. Chantrill and Mr J. D. Stevens. In this, it is stated that British Columbia's present generating capacity amounts to three million kW and the province will need 12 million kW by 1975, with new installations costing $2 billion. The Peace and Columbia rivers, however, can produce some three million to four million kW each. The report claims the Columbia will not be able to provide power until 1970, mainly because of the problems involved in reaching agreement with the US on co-operative development. "All power studies show conclusively that the Peace River and other projects of a Pacific international power pool will complement each other so as to conserve resources, increase load-carrying capabilities and strengthen the firm energy structure of BC and the Pacific north west States," the report says. Although development of Columbia power might be lower in cost than that from Peace River scheme, the result of the pooling system, however, would be to make power available at a moderate price. The power pool envisaged would embrace initially much of BC, Washington, Idaho and Oregon and, ultimately, Alberta, Montana, Utah and California.

Smaller Rise

An increase of 5-6% in net income this year is anticipated by the British Columbia Power Corporation, the parent company of the British Columbia Electric Co. Ltd. The only major factor which could narrow the profit advance would be the continuing decline in new house building. The company foresees a decrease in the annual rate of growth in demand for power because the forest industry, a key link in British Columbia economy, is facing a rough year.

Nuclear Cost

The Hydro Electric Power Commission of Ontario will be expected to pay $60 million, or about three-quarters of the estimated cost of Canada's first commercial nuclear power station, which is scheduled for completion in mid-1964. The station is being constructed at Douglas Point, Bruce County. Such a cost would allow the Commission to generate electricity at the same cost as if it were operating a modern coal-fired plant, Mr J. L. Gray, president of Atomic Energy of Canada Ltd., told a Commons committee on research recently. When the plant has demonstrated that it can be successfully operated in the Ontario Hydro system—Mr Gray said it was estimated this would take about three years—the Commission was committed to purchase the complete station at a price that would allow the utility to continue generation of electricity at the same cost as though it was operating a modern coal-fired plant. Fuel for the station would be relatively inexpensive compared with coal, Mr Gray told the committee, but the construction cost, always higher for an initial project, would be too heavy for Hydro to bear alone and operate at competitive rates of about 5·5 mills/kW. The AEC president said it was anticipated that subsequent doubling of the Douglas Point station's output would cost about $60,000,000.

JAMAICA

Another Extension

A contract for the engineering procurement, design and construction of a further extension of the Hunts Bay steam power station of the Jamaica Public Service Co. has been awarded to Stone and Webster Engineering Co., of London. The extension, to comprise one 20 MW turbo-generator together with boiler and auxiliaries, is scheduled for completion by May, 1962. Orders for some of the main plant required have already been arranged we understand.

QATAR

Evaporator Order

Two multi-stage vacuum flash evaporators, each having an output of 750,000 gallons of fresh water a day, are to be supplied by Richardsons Westgarth and Co. Ltd. for the Ras Abu Aboud power station, Qatar, to which we referred last week. These evaporators will operate on l.p. steam from pass-out turbo-alternators. They will provide high-purity water for both domestic and boiler feed purposes. This contract is stated to be worth £500,000.

SUDAN

Work Progress

The embankment at the rear of the dam for the Sennar hydro-electric power project in the Sudan has now been completed and work has started on the front embankment. The building of both embankments will enable work on the project to continue all the year round. The necessary equipment has arrived at the site and work is expected to begin at once. The project, scheduled to be completed in August, 1962, will cost £2 million and is complementary to the existing power station at Burri. The work is being carried out by a consortium of the English Electric Co. Ltd. and Siemens-Schuckertwerke, of Germany, and involves the installation of two English Electric 7,500 kW Kaplan water-turbine sets.

UGANDA

Continued Rise

A 15·1% increase in units generated in the first six months of this year is reported by the Uganda Electricity Board. The total amounts to 191·6 million units including 73·6 million exported to Kenya. In the month of June alone a total of 19·6 million units were generated, an increase of 11·1%.

INDIA

Another Proposal

The Madhya Pradesh Government has suggested setting up a nuclear power station at Bina during the third Five-Year Plan, with a view to meeting economically the power shortage in the Chambal region of Madhya Pradesh and the Rajasthan Kanpur-Matatilla service area of Uttar Pradesh and the adjoining Bundeilkhand region of Madhya Pradesh. It is proposed that the station should be initially planned with two 150 MW reactors, with provision for the addition of a third in order to meet the anticipated shortage of 409 MW in the region by the end of the fourth Plan.

Reactor Start-up

India's nuclear research reactor at Trombay became critical last week. Dr H. J. Bhabha, chairman of the Indian Atomic Energy Commission, announced that the reactor was loaded with a complement of 183 fuel elements, approximately half of which were fabricated in India from local uranium and the remainder supplied by Canada. By next January it is expected to produce its maximum rated capacity of 40 MW.

PAKISTAN

Railway Studies

A seven-man delegation of British engineers and railway experts were in Karachi earlier this month to explore the possibilities of railway electrification in Pakistan. They are to submit a report by the end of this year. Obviously that country is moving very cautiously and seeking advice and suggestions from all prepared to help. We reported on 19 May that an international consortium, consisting of leading railway firms in Western Germany, France, Switzerland and Belgium, were making a report on the subject, on top of that earlier received from a Japanese firm.

AUSTRALIA

"Mole" Ordered

The Hydro Electric Commission of Tasmania has ordered a £195,000 "Mole" tunnelling machine from America. It is to be delivered by next May and will be used, initially, for drilling three miles of tunnels for the Poatina hydro-electric scheme. The machine, which is electrically operated, has a rotating disc with rows of sharp-edged rollers of specially hardened steel. Rotation of the disc, combined with the powerful forward movement, crushes the rock ahead and the debris is passed back by a conveyer system. Although not suitable for use where hard dolerite rock is encountered, it is estimated that the machine will prove a tremendous saving by quicker operation through sandstones and mud stones, such as will be encountered in much of the tunnelling in the Great Lakes power development on which work is soon to begin. The saving in construction costs could be as much as £1 million it has been estimated.

NEW ZEALAND

Bulk Rate Unchanged

Because the financial results of the NZ Electricity Department continue to be very satisfactory, no increases in bulk power charges to supply authorities are envisaged this year, the Minister of Electricity, Mr Watt, announced earlier this month. Mr Watt was presenting the department's report for operations during the year ended 31 March last. In that period a net surplus of £1,159,000 resulted. A report of the committee reviewing power requirements was expected to be received soon and its findings would be considered by the planning committee responsible for framing recommendations for submission to the NZ Parliament. During the year covered by the report, approval of investigation of the potential of North Island rivers was given, Mr Watt said. This provided for the expenditure of £1,763,000 up to 1963-64 on investigations on the Rangitaiki, Whakatane, Waioeka, Ngaururoro, Tongariro, Motu, Mohaka and Wanganui rivers. The accelerated investigation programme in the South Island made provision for the expenditure by 1963-64 of £600,000 on investigating the potential of the Waitaki River. Concerning new generating stations, at the Meremere steam plant all six boilers and generating units have been in service, but full capacity will not be available till modifications to the superheaters and air heaters are carried out. These should be completed by October. At the Wairakei geothermal station, installation of all Stage I turbo-alternators was completed last March, and installation of steam separation equipment at Wellheads is proceeding to give enough steam to operate Stage I plant at full capacity. Installation of equipment to provide and use steam flashed from hot water is proceeding, but is behind schedule.

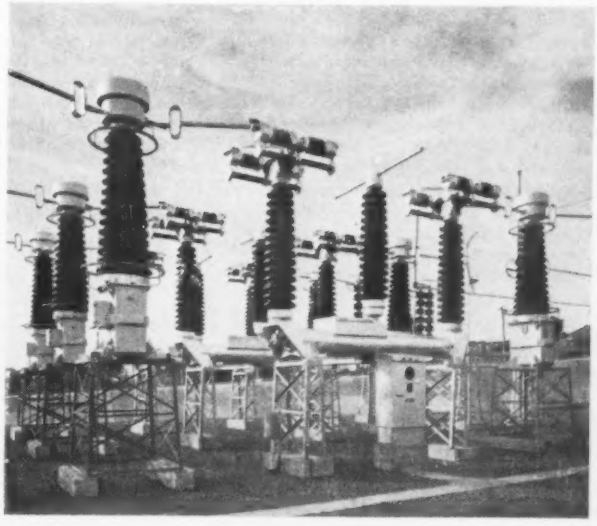
Steam Shortage

An unexpected drop in bore pressures may delay operation of the geothermal steam plant at the Tasman Pulp and Paper Co.'s mill at Kawerau, New Zealand. Government steam experts from Wairakei have been called in and further steam measurement tests are being made to determine the action needed to get the bores back to full pressure. Meanwhile, plant to use geothermal steam from four bores to heat clean water and to use surplus steam for electricity generation is nearing completion. If sufficient steam is available it could be in operation in a few weeks. Cost of the project is estimated at over £1 million.

THAILAND

Multi-purpose Plan

Australian engineers are to assist in a United Nations project to utilise the Mekong River in Indo-China. Australia's Snowy Mountains Authority surveyors will start work in October seeking potential dam sites. One member of the team has been in Thailand for preliminary discussions. The Mekong scheme envisages building eight hydro-electric and multi-purpose projects along the river to benefit the population in Laos, Thailand, Cambodia and South Vietnam. Australia will make a geological survey under the Colombo Plan at a cost of over £A180,000. Ten other countries are contributing.



AEI air-blast circuit-breakers recently supplied to the Electricity Trust of South Australia and installed at Magill substation, north of Adelaide. The circuit-breakers are rated 3,500 MVA at 275 kV, and are among 12 recently dispatched for switching stations at Port Augusta and Magill

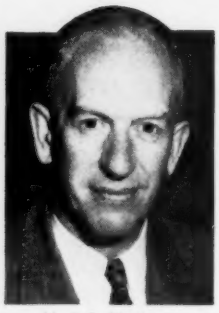
Personalities *in the industry*

Mr J. E. Tonge

Mr J. A. Brooks

Mr W. M. Cann

Mr G. D. Speake



Mr J. B. Hedley

Mr J. E. Tonge has been appointed a technical director of Courtney, Pope (Electrical) Ltd. Mr Tonge controls the Manchester office of the firm.

Mr J. A. Brooks, B.SC.(ENG.), A.M.INST.W., has been appointed divisional assistant manufacturing manager of AEI Motor and Control Gear Division. He will retain, for the time being, his position as superintendent, Large Industrial Machines Department, Mosley Road Works, Manchester, but will eventually be located at Rugby to devote his full-time to his new duties. Mr Brooks was educated at Bournemouth Technical College and took an external degree at London University. Following a college apprenticeship at M-V he served for a short time as welding sales engineer at the company's Birmingham office. In December, 1939, he joined the Technical (Engineering) Branch of the RAF, serving throughout the war and attaining the rank of squadron leader. In March, 1946, he became development engineer in M-V Leonard Works, but later moved to the Mosley Road Works; there he was responsible for the layout and installation of the Heating Element Department, of which he eventually took charge. Returning to Leonard Works in 1949, Mr Brooks was appointed assistant superintendent in 1950 and superintendent in 1952. Two years later, he was appointed superintendent, M-V Motor Department.

Strain and Robertson, the Glasgow consulting engineers, announce that they have taken into partnership **Mr J. S. Burgess,** B.SC., A.M.I.E.E., and **Mr W. Bannatyne,** B.SC., A.M.I.C.E., both of whom have been members of their staff for a number of years.

Sir Laurence Watkinson is to be the new chairman of the London Electricity Consultative Council in succession to **Sir Isaac Hayward,** who retires at the end of September, after being chairman of the Consultative Council since its formation in 1948. Sir Isaac is 75. Sir Laurence has been chairman of Harris Lebus Ltd., furniture manufacturers, since 1957. Earlier he served in the Board of Inland Revenue, Board of Trade and the former Ministry of Fuel and Power. (*ESH, page 75.)

General manager of the Industrial Division of S. Smith and Sons (England) Ltd., which is being established from 1 Aug., is **Mr W. M. Cann,** who has been general manager of Smiths Industrial Instruments Ltd. since May, 1955. The formation of this new Division we refer to on page 108.

Mr Geoffrey F. G. Hinings, general manager of Newton Brothers (Derby) Ltd., has been appointed a director of the company.

Mr J. Page has been appointed head office sales manager of Peerless and Ericsson.

Mr G. D. Speake, M.A., has been appointed deputy chief of research at Marconi's Research and Development Laboratories, Great Baddow, near Chelmsford. Mr Speake, who is 41 years old, joined Marconi's Wireless Telegraph Co. Ltd. in 1950, when he was engaged in radar systems research. In 1954 he was appointed chief of the Vacuum Physics Section of the Research Division, and two years later he became chief of the Microwave Physics Section. He was educated at Adams Grammar School, Newport, Shropshire, and St. Catharine's College, Cambridge. Prior to joining the Marconi Co. he was instrument manager at the Plastics Division of ICI Ltd. from 1942-46.

Formerly chief electrical engineer, **Mr J. B. Hedley,** P.ENG., has been appointed consulting electrical engineer of the British Columbia Power Commission. The latter also announce that **Col D. C. Stephenson,** P.ENG., senior construction engineer, has now been appointed consulting construction engineer. Promoted to new divisional posts with the Commission are **Mr E. H. Martin,** who will head the Construction Division; **Mr N. A. Magrath,** who becomes head of the Electrical Planning Division; and **Mr E. Crowley,** who is appointed head of the Programme Control Division. Mr Hedley has been a member of the Commission's staff since 1947. He is a past chairman of the Vancouver Island section of the Association of Professional Engineers of British Columbia.

Mr S. A. Austen Stigant, M.I.E.E., F.PHYS.SOC., F.AM.I.E.E., until recently technical adviser and education officer to Johnson and Phillips Ltd., and **Mr A. B. Adam,** secretary of the company, whose retirements we have already noted, were entertained to lunch by the directors at the J and P works last week. Our photograph below was taken after the occasion. Mr Adam is in the foreground on the left and Mr Austen Stigant on the right. Between them is **Mr W. Glass,** chairman and managing director. Also shown are: **Mr G. T. W. Whitehead,** works director, **Mr R. W. C. Reeves,** director and general manager, **Mr J. B. McRostie,** sales director, **Mr**

After the farewell lunch to Mr A. B. Adam and Mr Austen Stigant

*(*Denotes revision to the "Electricity Supply Handbook, 1960.")*

H. J. Olley, cable works manager, **Mr C. W. Bishop,** chief buyer, and **Mr N. D. Mathie,** secretary.

Mr F. H. Schroeder, M.I.MECH.E., A.M.I.E.E., has been appointed to the board of Metal Industries Ltd. For many years Mr Schroeder has been a director of Lancashire Dynamo Holdings Ltd., which became part of the Metal Industries Group earlier this year. He originally joined Lancashire Dynamo and Crypto Ltd. in 1928 and became manager five years later.

Lord Plowden has been appointed a director of British Columbia Power Corporation and its subsidiary, British Columbia Electric Company. **Sir Samuel H. Brown** has resigned from the boards of both the companies. Lord Plowden is chairman of British Aluminium Company and was formerly chairman of the UKAEA.

Acting director-general of CERN (European Organisation for Nuclear Research) since 23 April following the death of Prof C. J. Bakker, **Mr J. B. Adams** has now been appointed as director-general of that organisation until 1 Aug., 1961. As from 1 Oct., 1960, Mr Adams will serve in this capacity on a part-time basis since, by agreement with the British authorities, he will divide his time between CERN and the new laboratory for Plasma Physics at Culham, of which he is director designate.

Mr K. N. Swash, B.SC., M.I.E.E., and **Mr M. A. Slater** have accepted an invitation to join the board of Contactor Switchgear Ltd. Mr Swash joined the company a short time ago, after over 30 years' service with Brookhirst Switchgear Ltd. with whom he was district engineer and manager at Leeds from 1936 to 1948 when he became chief engineer, and was appointed a director in 1952. Mr Slater has been with Contactor Switchgear Ltd. for a number of years, holding executive posts in the Engineering and Development Departments.

Formerly district manager of the Birmingham works of British Electrical Repairs Ltd. (from which position he retired last December) **Mr J. Ashmore,** M.I.E.E., A.I.MECH.E., F.I.E.S., is now domiciled in Holland and has started up in business in Amsterdam representing Bri'sh electrical concerns there. Among the latter are South Wales Switchgear Ltd., Griffiths Bros. and Co. (London) Ltd., Hedin Ltd. and Bill Switchgear. Mr Ashmore, it will be recalled, was chairman of the IEE South Midland Centre in 1958-59.

Formerly London manager to the company, **Mr W. A. Cousins** has been appointed export sales manager of Belliss and Morcom Ltd. **Mr B. Noble,** previously assistant sales manager, becomes home sales manager.

Mr F. E. Sparks, A.R.AE.S., A.M.S.I.A.E., has left the Technical Branch of BOAC, and joined the staff of Electrolube Ltd. as technical manager.

Mr John T. Jackson has resigned as a vice-president of the International Telephone and Telegraph Corporation.

Mr R. Q. Exley, assistant district engineer for 22 years at Chester-le-Street, Co. Durham, for the North Eastern Electricity Board and its predecessor, has retired.

Mr C. J. Veness, left, is presented with the "Electrical Journal" Golf Cup by Mr E. G. Batt at the Electrical Industries Club luncheon last week

OBITUARY

Mr H. Cowan-Douglas, C.A., chairman of the Harland Engineering Co. Ltd., Glenfield and Kennedy Ltd., and other concerns, died on 12 July.

Mr J. H. Warren, O.B.E., M.A., who was general secretary of NALGO from 1946 to 1957, died on 11 July, aged 64.

Air Marshal Sir Raymond Hart, K.B.E., C.B., M.C., M.I.E.E., former Controller of Engineering and Equipment, Air Ministry, died on 16 July.

I.E.E. COUNCIL AND CHAIRMEN

Sir Hamish MacLaren, the new president

THE Institution of Electrical Engineers now announce the constitution of the Council, the various Section Committees and the names of the chairmen of the Local Centres elected for the session commencing 30 Sept. next. These are as follows:

President: *Sir Hamish D. MacLaren,* K.B.E., C.B., D.F.C., LL.D., B.SC.

New Vice-Presidents: *C. T. Melling,* C.B.E., M.SC.(TECH.); *B. Donkin,* B.A.

Hon. Treasurer: *C. E. Strong,* O.B.E., B.A., B.A.I.

Ordinary Members of Council: *Prof H. E. M. Barlow,* PH.D., B.SC.(ENG.); *D. A. Barron,* M.SC.; *C. O. Boyse,* B.SC.(ENG.); *F. H. S. Brown,* C.B.E., B.SC.; *Prof M. W. Humphrey-Davies,* M.SC.; *L. Drucquer; J. M. Ferguson,* B.SC.(ENG.); *R. J. Halsey,* C.M.G., B.SC.(ENG.), F.C.G.I.; *Prof J. M. Leek,* D.ENG.; *The Hon. H. G. Nelson,* M.A.; *H. V. Pugh; R. L. Smith-Rose,* C.B.E., D.SC., PH.D., F.C.G.I.; *J. R. Rylands,* M.SC., J.P.; *G. A. V. Sowter,* PH.D., B.SC.(ENG.); and *H. G. Taylor,* D.SC.(ENG.).

Associate Members: *J. C. Arkless,* B.SC.; *D. C. Flack,* B.SC.(ENG.), PH.D.; *R. A. Hore,* M.A., B.SC., WH.SC.; and *D. H. Tompsett,* B.SC.(ENG.).

Companion: *Sir John Dean.*

Associate: *J. S. McCulloch.*

New Chairmen of the Sections are: Utilisation—*J. M. Ferguson,* B.SC.(ENG.); Supply—*J. E. L. Robinson,* M.SC.; Measurement and Control—*C. G. Garton;* Electronics and Communications—*T. B. D. Terroni,* B.SC.

Chairmen of the Local Centres are: North Midland—*F. W. Fletcher;* East Midland—*Lt-Col W. E. Gill,* T.D.; Southern—*R. Goford;* Northern Ireland—*J. McA. Irons;* South Midlands—*Brig F. Jones,* C.B.E., M.SC.; North Western—*F. Linley;* Mersey and North Wales—*D. A. Picken;* Western—*A. C. Thirtle;* North Eastern—*D. H. Thomas;* and Scottish—*R. B. Anderson.*

Sections—In addition to T. B. Terroni as chairman, the **Electronics and Communications Section Committee** has *R. J. Halsey,* C.M.G., B.SC.(ENG.), F.C.G.I., as vice-chairman, and new ordinary members of committee are: *W. H. Aldous,* B.SC., D.I.C.; *W. J. Perkins; K. F. Sander,* M.A., PH.D., B.SC.; *J. A. Saxton,* D.SC., PH.D., A.R.C.S.; *T. R. Scott,* D.F.C., B.SC.; and *F. J. D. Taylor,* M.B.E., B.SC.(ENG.).

The Measurement and Control Section Committee will have *C. G. Garton* as chairman, *W. S. Elliott,* M.A., and *A. J. Maddock,* B.SC., as vice-chairmen, and the following new ordinary members of committee: *S. S. Carlisle,* M.SC.; *W. J. Jefferson; C. A. Laws;* and *F. C. Widdis,* B.SC.(ENG.), PH.D.

For the **Supply Section Committee,** with *J. E. L. Robinson,* M.SC., as chairman, the vice-chairmen will be: *C. H. Flurscheim,* B.A.; and *J. S. Forrest,* D.SC., M.A.; and new members of committee: *E. S. Booth,* M.ENG.; *Prof M. W. Humphrey-Davies; N. G. Simpson;* and *F. C. Walmsley.*

The **Utilisation Section Committee** will have *J. M. Ferguson,* B.SC.(ENG.), as chairman; *W. G. Thompson,* PH.D., B.SC., as vice-chairman; and new members of committee: *J. E. Boul,* A.C.G.I.; *A. V. Lawry; P. M. Martin,* B.SC.; *A. V. Milton;* and *Prof G. H. Rawcliffe,* M.A., D.SC.

Helicopter aids grid repairs

"WEATHER couldn't have been better," said the Divisional Transmission Engineer delightedly, as the rain fell in a fine penetrating drizzle from low cloud. Apart from the sodden representatives of the Press standing with him, the field contained a 132 kV transmission tower and a helicopter.

The helicopter had just proved its worth as a means of locating faults on transmission lines, an exercise organised by the South Eastern Region of the CEGB, prompted by anxiety about the security of supply in Kent and East Sussex next winter. It will be recalled that there has been considerable delay in obtaining approval for the 275 kV grid extensions from Northfleet to Canterbury. As a result, supply is maintained by three 132 kV lines whose loading during the winter approaches very close to their maximum capacity of about 270 MW. Certainly a fault on one of these lines would mean the supply to a large area being cut off. This situation may well arise during one of the snow-storms which are a fairly frequent occurrence in Kent and deep snow could prevent a repair team reaching a fault for two or three days. It was to overcome so serious a supply dislocation that use of a helicopter was considered.

Possibility of a Fault

Heavy snow on the lines occasionally results in a broken conductor and the exercise proved to the engineer's satisfaction that, by flying a helicopter along a line, even in bad visibility, a broken conductor could be easily seen.

By careful planning it has been found possible to fly all men and materials necessary to effect a repair to site in three flights. The helicopter load is restricted to 780 lb and a team of seven men would probably be required, together with conductor repairing tackle, conductor wire and spare insulators.

Modifications made by CEGB engineers to the well-known "Tirfor" cable tensioner enabled it to be adapted for transport by helicopter. These modifications allowed it to be used in place of the usual heavy motorised winch for tensioning the conductor. If a fault should occur on a line in conditions which would make road access impossible, the CEGB headquarters at Canterbury would request a helicopter from the Battersea Heliport. Bristow Helicopters estimate that it would be possible to send a helicopter within an hour if flying were possible. The helicopter would land on Canterbury football ground for loading with men and materials.

To ensure the exercise was genuine, one of the line conductors was broken in mid-span by a line team from Brighton. The local team had no knowledge of the actual break position, but they found it to be clearly visible from the helicopter as they flew along the line. The break was made near the village of Iden, about 26 miles from Canterbury on the Hastings-Folkestone line.

Among the first team carried along the line would be an engineer, who would assess damage and send back a report, with the helicopter, asking for the necessary men and materials to effect the repair. The helicopter also carried vhf radio of the type used by mobile repair teams.

Flying time for the helicopter is charged at from £35 to £45 per hour and standby time at £5 per hour. Against this charge must be balanced the short time to locate a fault, only about 20 minutes in the case of the trial, and the avoidance of a supply interruption which may well last for three or more days in a deep snowfall.

During the exercise the CEGB received full co-operation from the Canterbury football club and also from the local farmer in Iden village.

Above, the helicopter used to find the broken conductor. The lower pictures show unloading repair conductor and materials from the helicopter and lowering part of the damaged tension insulator

Electrical heating for industrial processes and plant—PART 2

By A. E. Williams, Ph.D., F.C.S.

USE of electrical resistance heating for industrial purposes offers advantages of accurate location of the required heat and ease of control. In the first part* of this article, applications in road transport were considered, together with the use of heating tapes for pipework and the heating of valves and pumps.

Flameproof Areas

Certain areas in works and factories have to be specified by the authorities as "flameproof areas." These are areas where, in the opinion of the authorities, a danger of explosion exists by reason of the presence of inflammable gas, vapour, liquid, dust, etc. In such areas electrical equipment used must be of special construction and meet with the approval of the authorities. Some of the electric heating mantles are designed to meet these requirements (Fig. 7), and they are employed for heating inflammable materials which would be likely to cause a fire if heated by other means. The elements in these heaters are earthed through the shield, and sparking and short circuits are impossible even if spillages occur.

Because the material being heated may have a flash-point lower than the temperature attained by the element, heating the material through the wall of the vessel, a system has been devised for totally enclosing the vessel being heated in a container. The construction is such that it enables the heating element to be distributed with uniformity over the whole of the vessel surface, so avoiding risk of the material being locally overheated.

The great majority of electric heating mantles are so arranged as to match ideal load distribution, which means that the lowest third of the heating area has a slightly higher heat concentration, the middle third has the rated heat concentration, while the upper third has a slightly lower heat concentration. For example, a 500 W/sq ft mantle will have a loading of about 600 W on the lower third, 500 W on the middle third and 400 W/sq ft on the upper third of the heater. Heating mantles for small and medium size production plant, of 50 to 500 gallons capacity, are usually made in one piece, covering the whole surface of the vessel, and generally such vessels are supported just below the top flange, leaving four to six inches clear all round the vessel. Vessels up to about 150 gallons capacity are preferably supported with three pipe legs, which allows easy application of the heating mantle from the side; so avoiding having to lift the vessel for this purpose.

It is general practice for vessels of from 500 to 2,000 gallons capacity to be supported from the cylindrical side, and the heating mantle is then subdivided into base and side-heating units. Each section of the latter is complete with its metal outer shell, lagging and heating surface, and carries terminal boxes arranged for interconnection to a control unit. With these larger vessels the number of heating mantle sections depends on the size and design of the vessel. In many cases a vessel which has been heated by other means can be fitted with electric mantles, for the latter are versatile in their application to containers of practically any shape or size.

Drum Heaters

Electric heaters have been designed specially for the heating of drums and similar containers carrying products which require heat to liquefy them or to render them sufficiently fluid to be removed from the container. Materials of a viscous or solidified nature are often delivered in drums, and there is always some difficulty in completely emptying the container. This often leads to wastage of material; also, where the containers are going to be re-used, the process of cleaning is prolonged. By the use of an electric heater, not only can the drum contents be easily emptied out of the drum, but the latter can be washed out with water heated by the electric unit. Often a full drum of material is too heavy to be lifted manually, and in this case the electric heater can be brought to the drum to facilitate the discharge of the contents.

A typical drum heater has an outer casing of mild steel sheet and consists of two hinged halves. The top section is of similar construction to the side sections, and one of the latter can be secured firmly to the drum, while the other may be swung on its hinges to give quick access to the drum. The two heating panels, one in each half of the side sections, are totally enclosed and are suitable for use in a fire hazardous area. This means a drum heater can be used in a garage where petrol is stored to warm up heavy oil before discharging from the drum.

Where materials of very poor thermal conductivity are to be heated, a drum heater incorporating a base heater is employed, for in such cases it is advisable to heat the base of the drum as well as the cylindrical sides. Where only low temperature and slow heating up rates are needed, the base heater may be used on its own, while this heater is also employed alone when it is desired to maintain only a moderate heat on the drum for a period, such as overnight. Automatic thermostatic controls may be used with the drum heaters and these will maintain any desired temperature up to about 300°C.

For the rapid melting of solids which are not sensitive to heat, it is convenient to use heating elements of heavier loading, thus obtaining still higher temperatures and quick melting of the drum contents. In the melting of solids, those with poor heat-transfer characteristics will initially have a thin layer of material melted next to the drum wall. Further melting of the solid will then depend on the speed with which the heat can be transferred through the liquid portion into the remaining solid portion. Increase of loading on the heater will not always result in speedier melting of the product if the thermal qualities of the latter are not favourable. Good results are obtained in such cases by cutting the core of the product remaining unmelted into several sections; this increases the surface area of the product exposed to heat.

The heating of drums and tanks of

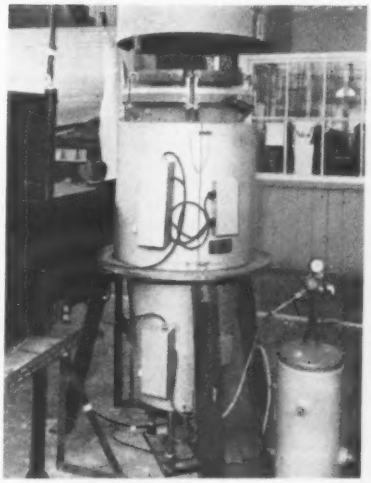


Fig. 7. Electric heating mantles in use in laminating fibreglass and resin for aircraft components (Bristol Aircraft)

* Part 1 of this article was published in the issue of 16 June, 1960, p. 967.

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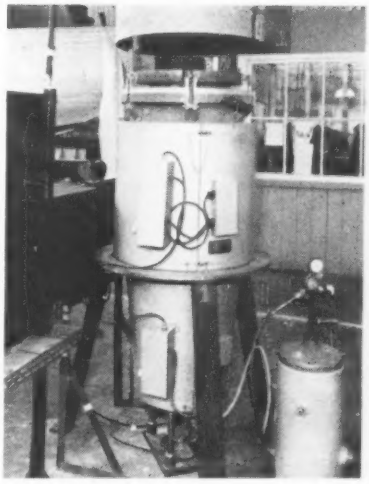


Fig. 7. Electric heating mantles in use in laminating fibreglass and resin for aircraft components (Bristol Aircraft)

For the rapid melting of solids which are not sensitive to heat, it is convenient to use heating elements of heavier loading, thus obtaining still higher temperatures and quick melting of the drum contents. In the melting of solids, those with poor heat-transfer characteristics will initially have a thin layer of material melted next to the drum wall. Further melting of the solid will then depend on the speed with which the heat can be transferred through the liquid portion into the remaining solid portion. Increase of loading on the heater will not always result in speedier melting of the product if the thermal qualities of the latter are not favourable. Good results are obtained in such cases by cutting the core of the product remaining unmelted into several sections; this increases the surface area of the product exposed to heat.

The heating of drums and tanks of

* Part 1 of this article was published in the issue of 16 June, 1960, p. 967.

lubricating grease in engineering works comes within the sphere of the electric heater. This warm grease is applied to components before assembly and also to parts which are to be packed for shipping, and the method represents a quick way of putting a protective coating of grease on ferrous components to prevent rusting. One such heated drum containing grease may be sited at the end of a conveyer line and, as the parts come off the conveyer, they are dipped into the warm grease. As the grease has to be kept at a definite temperature throughout the working day, electric heating is a safe and convenient way of doing this without overheating the lubricant. An automatic time switch comes into operation shortly before the working shift commences, and the grease has already been heated up to the required temperature ready for use; thus there is no delay owing to cold lubricant.

Controls

With nearly all these various forms of heating appliances the greatest efficiency is obtained by the use of controls, which make for economy in current consumption and protect the products being heated from possible damage by overheating. The control unit most commonly used is an energy regulator which operates on the principle of switching on and off the energy input to the equipment; the relation between time-on and time-off is determined by the setting of an indicator on a dial. A typical regulator of this type is the "Statotherm" (Stabilage Co.), which makes it possible smoothly to regulate the electrical input between 10% and 100% of the rated consumption. The mean heating output achieved with the regulator is obtained by the intermittent operation corresponding to the time for which the heating element is switched on or off. The heating coil of the regulator is operated at the mains voltage and serves to heat a bi-metal strip. When flexed to a sufficient extent, determined by the position of the control knob, the bi-metal strip switches off the heaters. When the strip has cooled sufficiently the current is again switched on through a snap switch. A supplementary integral bi-metal compensator enables the regulator to be employed at different room temperatures without altering the regulating times. Maximum load on the contacts is 10 A with a non-inductive load. These instruments provide a wide range of temperature settings suitable for most industrial applications.

As an alternative to the energy regulator, a variable auto-transformer may be used. This generally has a primary winding of 230 V, and supplies a variable regulated output from zero to 270 V; for special applications, the voltages may be higher or lower. The variable auto-transformer is used when the material being heated is of low specific heat, and requires a very accurate control of heat input. In general, it provides a continuously variable output voltage from zero to about 20% above the normal input voltage.

In a single circuit employed for a small heater, the regulator is wired in series with a fuse and neon-indicator; in multiple circuits, accurate control is attained by employing a regulator, fuse and neon-indicator on each circuit. Thus if one circuit fails it does not affect the others and the neon light indicates which one has failed. Temperature indicators may be fitted to any installation, in which case thermocouples are provided for insertion between the equipment to be heated and the heating surface. In larger types of equipment these thermocouples are built into the heating surface and brought out into a separate terminal block.

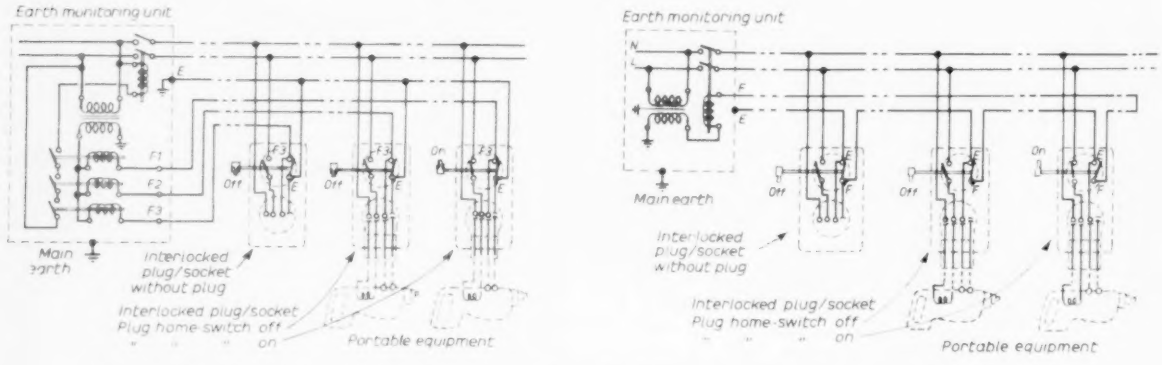
(Concluded)

PORTABLE MACHINE TOOL PROTECTION

PORTABLE and transportable electrical appliances still figure high in the annual list of electrical accidents, despite the increasing use of current balance leakage protection in industrial locations. The plain fact is that a break in the earth core of three-core cables on portable appliances is not self-evident and appliances fitted with three-core cables (or four-core on three-phase appliances) introduce a sense of false security unless some method of instantaneously announcing the failure of the earth channel is incorporated.

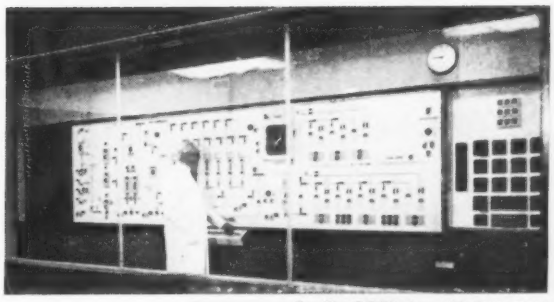
This has now been achieved by a simple and effective device developed by Siemens-Schuckert (Gt. Britain) Ltd., the Earth Monitoring Unit. Briefly, this is a hold-on contactor, operated by a 12 volt a.c. supply derived from a transformer in the unit, which is connected in series with the earth core of the trailing cable, via an insulated earth monitoring circuit and an earth-return system. Failure in any aspect of the earthing circuit automatically opens the contactor and isolates the tool.

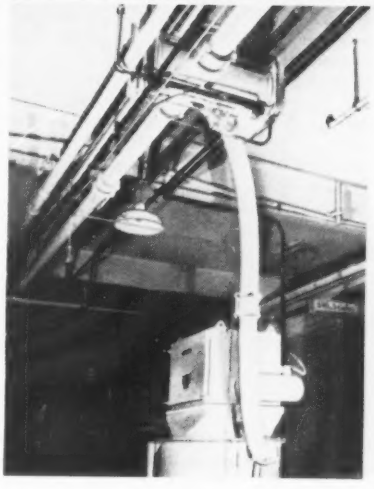
For multiple tool socket systems, two arrangements are possible. Where there is no chance of inadvertently earthing the case of any one tool, special plug/socket sets are available which provide a continuous series circuit through unused or switched-off appliances. For cases where the tools may come into contact with earthed metal, a modified earth monitoring unit provides a number of parallel monitoring paths. An important point in connecting the earth and monitoring cores to the tool is that each is connected to a different part, so avoiding the risk attendant to failure of the earth connection on the tool. The complete unit also incorporates current balance earth leakage protection.



The Siemens-Schuckert Monitored Earth Circuit Protection as applied to earth-free (right) and earth-viable (left) locations.

Automation in the biscuit industry





The control centre with, below, a diverter valve feeding a flour receiver

PRINTED circuitry for biscuit manufacture may seem rather a fanciful idea at first sight, but, far from being fanciful, it is a practical and working proposition at the Carlisle factory of Carr and Co. Ltd. The new installation, which has commenced its production runs within the last few weeks, was first conceived about 18 months ago and has been developed by the close collaboration between the company's engineering department, the main contractors for the plant, Thos. Robinson and Son, of Rochdale, and Elliott Bros. (London) Ltd., who designed and supplied the weighing, logic and control equipment.

Flour Intake

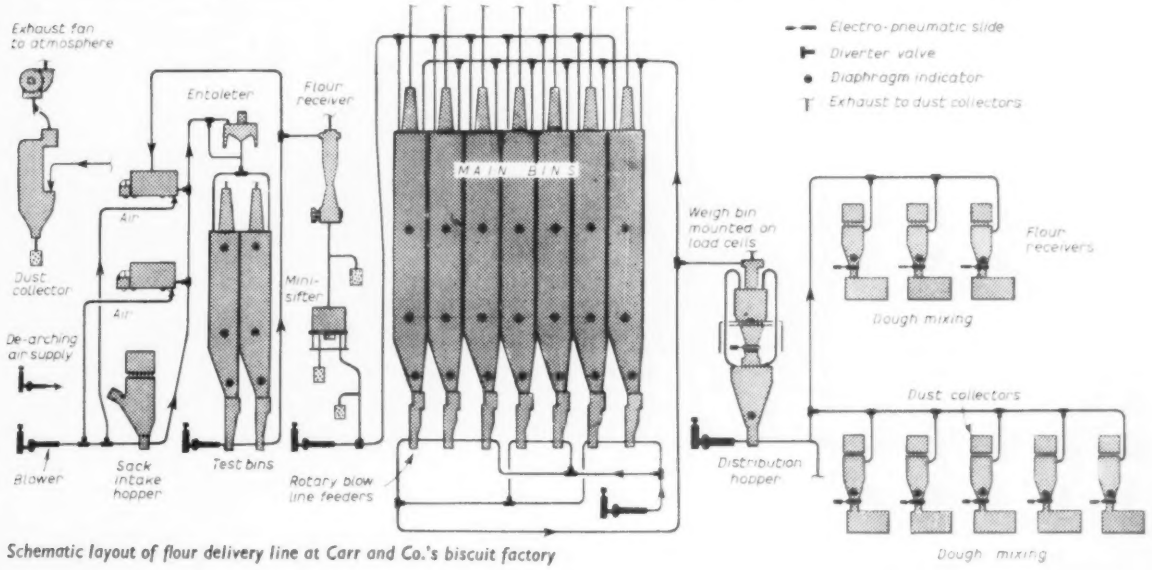
The main constituent in biscuit manufacture is, of course, flour, many tons of which are used every day. This is delivered either in sacks, or in bulk from special vehicles, from which it is extracted by air line, passed through an entoleter—a device for destroying non-virus living organisms by the simple expedient of whirling them to death in a centrifuge—and then on to the test bins. Intake from bulk is at the rate of up to 18 tons/hr; from sacks, up to 5 tons/hr.

Contents from the test bins, each holding 15 tons, are sampled and tested. If approved, the contents are then transferred by pipeline to the main bins; if rejected, they are piped back to the lorry by a return blowing line. In transit to the main bins, each of which holds 31 tons, the flour passes through a Robinson Minisifter for redressing.

Flour from the bins is discharged by worm dischargers into intermediate hoppers from which it is conveyed by air line to the weigh bin and, thence, to the flour receivers over the dough mixing plant. The amount of flour required for each batch is telegraphed to the controller who weighs it out automatically into a distribution hopper and then dispatches it to the selected receiver by remote manipulation of the appropriate diverter valves in the flow line. Excess flour in the conveyer lines is diverted back to the storage bins. The weigh bin will weigh batches up to 800 lb and these may consist of up to seven different types of flour in exact proportion, selected from the storage bins automatically. The flour-delivery scheme, shown in the diagram below, is a copy of the mimic diagram on the central control panel depicted at the top of this page. Dust from the bins is collected by an extraction line.

Other Ingredients

Fats, syrups, glucose and other biscuit ingredients are also weighed out from the control centre and passed to the dough-mixing machines, the flow also being monitored on the mimic diagram. All the processes for delivering the necessary ingredients to the dough-mixing machines are thus centralised at one point and are under the control of one man. A teleprinter, in the recess at the left of the panel, times and records operations and quantities. Completely automatic control can be brought into service under a pre-programming system in which control functions at the panel are initiated through recipe cards. These are printed-circuit matrices with plugs inserted into holes corresponding to ingredients and quantities for particular biscuits. The programme panel can be seen on the right of the control board, a mechanical programmer dealing with all requests automatically.



Schematic layout of flour delivery line at Carr and Co.'s biscuit factory

Electrical Maintenance Schemes

by "Surveyor"

WORK as an electrical surveyor for an insurance company involves visits to various types of industrial plant for routine inspection purposes and on occasions to investigate breakdowns. Electrical staff are met and opportunities occur to see how they cope with the maintenance problem and judge the degree of success by the appearance of the equipment and the actual number and causes of the breakdowns. Usually the smaller firms, even though employing a maintenance staff, will have no laid down maintenance scheme; however, the following remarks may be of interest both to these firms and the more ambitious types who have made some attempt to organise their maintenance work. One way to comment on electrical industrial maintenance would be to outline some ideal preventive maintenance scheme the author has come across. However, a number of schemes have already been described in the ELECTRICAL TIMES and perhaps a more critical, even though necessarily a more discursive article on what seems to happen in practice, would be a change of approach.

Master Card Details

Where there is a maintenance scheme the usual thing is to have a master record card (as well as job cards, layouts of plant, etc.) for each separate item of electrical equipment. That card has all the details on it, the nameplate details heading the list. There is no need to enumerate what is on this card, but it may be useful to note several items which sometimes get left off.

The commutator diameter when new is a guide to the limit which it can be skimmed down, although this dimension also may be known at the time of installation and can be recorded on the card. If having this information provokes skimming commutators to eradicate a few score marks then the knowledge is being misused.

Some places have no record of the bearing details, even though every minute of a breakdown costs money. A motor will start to emit that tell-tale bearing squeal and, if for some reason the motor cannot be stopped, at least the staff can get hold of the correct replacements, if known, and stand by ready to fit them as soon as the motor is accessible. It often happens that a motor has to be dismantled and the worn bearings examined, before replacements can be sent for. One firm known to the author gets the bearing details of each new machine as it arrives on the premises by dismantling the motor, though perhaps a saner method of getting these details would be to write to the motor manufacturers. If records are being started, then a list of all the motor serial numbers can be sent off to the appropriate makers.

The size of cable and the correct size of fuse should go down on record, for it is common to find a number of fuses fitted which are too big to protect the circuits. In the case of motor circuits, fuses fitted which are too small contribute to the percentage of burnt-out motors by causing single phasing. If the fuse and cable sizes have to be recorded, the chances are that the supervisor can look up the IEE current rating tables and in the case of a motor refer to Reg. 316, etc., if need be. He may even have the British Standard Code of Practice, CP 321.102 at hand. In the case of h.r.c. fuses, the maker's tables, or curves of recommended values, will be consulted to suit the drive, these values being based on the type of starting employed, etc., then the right fuse can be chosen. It cannot be said too often that the fuse in a motor circuit is there to protect the wiring and not the motor. Whilst it is all right to increase the cable size to suit the fuse, it may not be advisable to reduce fuse size to suit a smaller cable. It will be appreciated that there is a better chance of getting the right size of fuse chosen by a supervisor, with the appropriate data available, than by leaving it to the man doing the job. It only remains to say that the maintenance staff should be instructed not to alter the fuse rating without consultation with the supervisor, this same instruction applying to the setting of the overloads, which is the next thing to be considered.

Overload Trip Setting

Choosing overload tripping current used to be easy. After reading the nameplate, and checking that the volts agreed with the supply volts, all that was then required was to add 25% to the motor full load amp, this being the setting of the overload trips. This method, whilst not being too demanding on the intellect, demands a lot from present-day motors, especially with the introduction of c.m.r. machines. In the author's opinion the overloads should be set as low as reasonably possible and, although this is not saying much, it certainly is true that not enough effort is applied in getting the setting lower than 120% to 125%. The use of thicker oils in certain types of overloads cures nuisance tripping time and time again. One case recently in a laundry was overcome by getting the machine minder to start the machine declutched and not, as he was accustomed to, with the full load on the motor. One school of thought advocates 110% to 115% f.l. as the trip amp setting for c.m.r. motors, this same school pointing out that BS 587:1957 allows overloads a tolerance of 10%, the implication being that obviously 10% is too much. It is stated in this BS that overloads should no longer be set at 25%. The fact is that even with an ammeter fitted and a machine minder in attendance, the only protection which a motor has all the time is the overloads.

Another item which one firm had incorporated on the master card was the name of their electrician, or the name of the contractor who had installed the machine. The fact that the name of the person who installed the machine is recorded may, or may not, improve the workmanship. However that may be, the author would like to make out a case for maintenance staffs doing their own installations. Even if it means letting the maintenance scheme get behind schedule! It is one way for the staff to get to know the equipment as they will have to study the wiring diagrams and connect up and, finally, test before putting into service. Most staffs seem to have their hands full and if a large installation job comes along they tend to call in the contractors. They may be missing a chance to get extra staff out of the management, extra hands who can then be retained for a really efficient maintenance scheme. A number of breakdowns are due to slipshod installation work such as loose connections and, if one's staff has been indoctrinated with ideas consistent with good practice, then this trouble is eliminated at the outset. On new installations the author finds conduits loose on walls, locknuts not tightened up, brushes missing and the flexible conduit already coming out of the couplings. All trivial faults, but adding up to a poor job and possible trouble later.

Punctuality

It has already been implied that the maintenance scheme, if one exists, may get behind schedule. This unthinkable state of affairs is never even hinted at in most maintenance schemes. In practice it is rarely feasible to lay on a couple of dozen extra electricians to tide over bad patches—and they do occur. One way to get round this difficulty is to have priorities. For example, it may be that the contacts on a motor starter burn away every six months and, therefore, the schedule gives four months as the frequency of attention for these contacts and also it may be that the bearing grease on the motor is down for changing every 12 months. The contacts inspection every four months is

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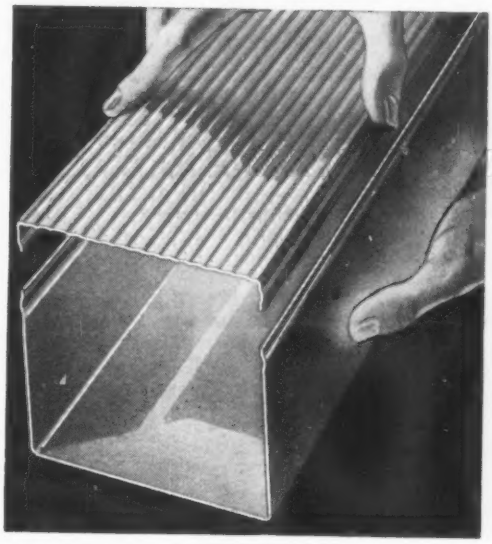

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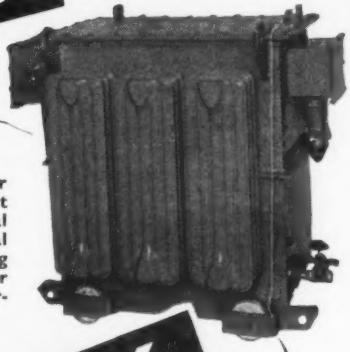

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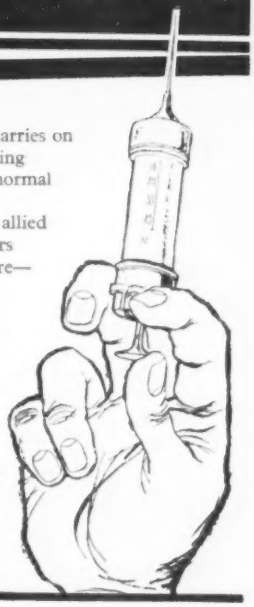

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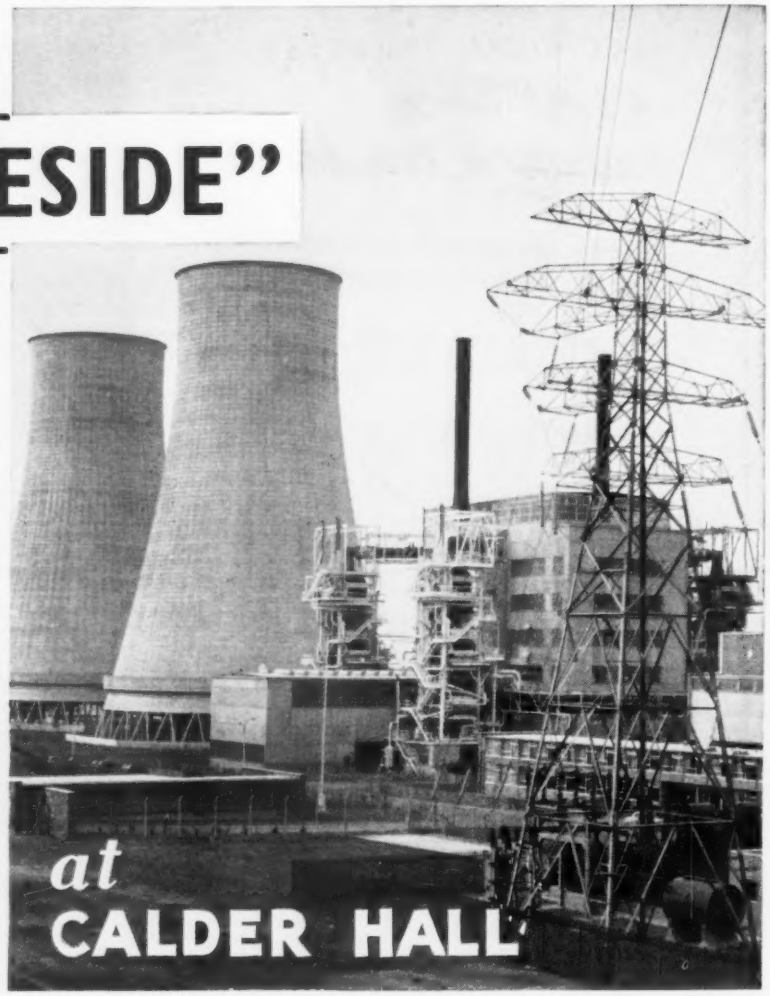

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given a priority as, obviously, if they are not looked at within this period, there is going to be trouble. If the priorities have not been attended to within the time limits then no other maintenance work is carried out. It starts again only after priorities have been satisfied. Another point, considering the same example: it may be that the motor stands idle for two years and consequently the contacts do not deteriorate and it is wasting the electrician's time instructing him to drop the oil tank and inspect them. If there is an entry on the job card (not the master card) which is issued to the electrician asking his opinion as to the frequency of inspection, this should bring facts like these to light. The fuses for this machine could be removed and the machine will then require quite a different type of maintenance. The scheme must be flexible and adaptable to changes, mainly for the reason that the available labour force is usually limited and must be used to the maximum advantage.

Inspection Rota

The frequency of inspection must be decided in the light of the staff available and previous knowledge of breakdowns and the situation and importance of the machine. Perhaps a special word could be said here on the subject of portable electric tools. If in the past maintenance of these machines has been a haphazard affair, then the author's advice is to write down "three months" as the frequency of inspection and to treat them as priorities. About five years ago he inspected the electric tools at a small engineering firm where the ten portable tools were not used on production and seven of them were found to have broken earth leads. The earth continuity conductors of a proportion of portable tools will be found to be broken where portable tools are not maintained, but only repaired "as required." The reason for this is that if the line or neutral lead breaks, then the machine stops and, therefore, gets repaired. If the earth lead breaks, nobody knows about it. The aim here is not preventing breakdowns, but accidents and the point to watch is the earth continuity. Perhaps the biggest factor causing faults here is that the outer sheath of the flexible lead is not held by the cord grip and the usual reason for this is that the plug has been fitted by an amateur.

One of the points mentioned when considering the frequency of inspection was the importance of the machine, and amongst key plant which tends to get neglected are transformers. If a transformer breaks down, a whole department or the whole works may stop production and, although they are trouble free as a rule, their importance warrants some attention. Perhaps the minimum is to take an oil sample every 12 months during the works shut down and send it to be analysed; that will cost only a few shillings. It is not suggested that to go much further than this is necessarily a good thing and to raise the windings every 12 months or two years strikes me as wrong and, in practice, seems to do more harm than good, but probably the main objection is that it is time wasting.

Providing a maintenance man has enough nerve, against the frequency of inspection of some machines will be written the word "none," because there are machines which seem to lead a less trouble-free existence when the loving care and attention of even a conscientious maintenance staff is withheld from them. One of these machines is the glass bulb mercury-arc rectifier. Other pieces of equipment which suffer from maintenance are relays, which should not be burnished for the sake of appearance, and some contacts receive attention when they would be better off without it. The craters, etc., are filed away and this reduces the amount of metal and also the pressure of contact. Even silver contacts get filed sometimes, which is an expensive business.

It may be relevant here to point out that most machinery is better off without poor workmanship. One good example is that of bearing maintenance. The instructions may be to change the grease and the electrician scrapes most of the old grease out and replaces with new grease, but in the process introduces dirt, grit and moisture. The bearings would be far better left alone. One case comes to mind where 20 motors had worked a 40-hour week for about 12 years without any trouble. The 20 motors were then overhauled and the following week two broke down and the week after another one. The management at this place were not sold on the idea of preventive maintenance after this episode.

Some fan motors situated above a paper machine cost about £10 in labour charges to get down to the ground. As it does not matter if one breaks down, i.e., no production is lost, the motors are just left alone. If one does burn out it is rewound with glass-covered wire (silicone is another alternative) and put back.

Fruitful Maintenance

A poorly run scheme can waste time and a well-run scheme can save it, one way being that as records of what the electrician has actually done pile up, it may be wise to think of a remedy for the things which seem to require a good deal of attention. One example of a delta-connected motor burning the contacts out too frequently was cured by connecting the motor in star. The solutions to these problems will not always be obvious. The accepted solution in the case of the grossly underloaded motor would be to substitute a smaller one. Flexible conduits to some motors also required frequent attention, at least once every 12 months and the tubing, in fact, came adrift within this period. As the motors were not on slide rails there appeared to be no justification for using flexible conduit at all, except for some vibration from the motors. The instruction was therefore given to continue the screwed conduit system into the motors and this was done. There are, of course, some flexible conduits on the market now which stand up to almost anything, including water; the reference above is to the common flexible conduit, which should not worm its way onto any respectable installation.

Another strange performance at some works visited is blowing out motors. One extreme case is in the boiler house of a large paper works, where a screen protected motor is blown out every week and large clouds of black abrasive dust is extracted from the motor. From past experience, it is known that this dust can actually wear through the insulation and, with all the blowing in the world, the dust will eventually produce a breakdown. It is almost unbelievable that this machine was ordered for the situation. The initial outlay on a more suitably enclosed motor would have been recovered inside 12 months. The motor is invariably blown out on a Sunday when the poor chap, who looks like a chimney sweep when he has finished blowing, gets double pay.

Preventing Trouble

Several firms make a point of sending someone round the department or works usually towards the end of the shift and this often results in nipping trouble in the bud. A commutator, which is sparking, will receive attention before any damage results. Any overloading of machines may be noticed by glancing at the ammeters, or thermometers, or by simply feeling the machine. The machine minders get used to this patrol and will report anything unusual.

Most of the comments have been made with the type of plant in mind where a breakdown is a serious thing and costs money, and even in this type of plant, the cost of maintenance has got to be weighed against the time loss, etc., and borne in mind.

Some schemes leave a great deal to be desired, one reason being that in the smaller firms the electrical maintenance scheme may not be run by an electrical engineer at all and may be in the charge of the chief engineer, or the manager or the clerk of works and so on. A lot of thought may have been put into these latter schemes, but they fail because the scheme itself seems to be treated as being more important than the plant, the tail tries to wag the dog.

However, it is true to say that in most firms engaged on continuous production the cost of a preventive maintenance scheme would quickly be recovered and would show a profit. There remains a good deal of management educational work to be done in this field excepting, perhaps, in some of the bigger organisations where they are fully aware of the returns which can be had from well planned and costed maintenance. Smaller firms all too often look upon an organised maintenance section as a waste of productive labour instead of an insurance against productive loss through breakdowns.

Short-circuit protection on factory systems

THE incidence of short-circuits on well-maintained factory systems should be few and far between, but, on the odd occasion when they do occur, thermal and magnetic stresses set up in the conductors, both in the cabling and switchgear, can be responsible for quite considerable damage. It is important for the factory engineer to have some idea of the magnitude of such forces and the limits to which short-circuit currents will peak with fuses and breakers of different ratings, and located at various positions on the factory distribution system, so that he may position and select his protective devices with a reasonable degree of intelligence.

A well-known formula for the maximum forces set up between two circular conductors is:

$$F = \frac{5{\cdot}4 \times I_p^2}{10^7 \times S}$$

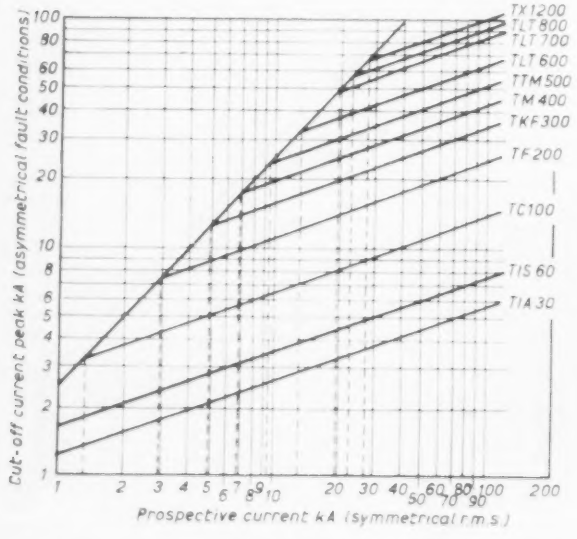
where F = force in lb/ft run

I_p = initial peak amp

S = spacing between conductors, in.

That is to say, the vital factor is the current in the circuit rather than the available MVA from the transformer or alternator supplying the circuit. The low power factor which accompanies short-circuits, usually of the order of 0·3 but if adjacent to the transformer possibly as low as 0·15, means that the current may be 2-2½ times the r.m.s. value of the symmetrical current and this peak will be reached within the first or, at the most, second cycle.

One of the merits of the h.r.c. fuse is that it exhibits a prospective "cut-off" value at which it will interrupt the current within half a cycle (0·01 sec). By choosing a suitable rating, the engineer can ensure that the peak short-circuit current is never reached. For example, a 25 MVA 440 V system will have a symmetrical peak current of 33,000 A, but at 0·3 p.f. it will be 66,000 A. A 30 A h.r.c. fuse will cut off at approximately 3,900 A, whereas a 300 A fuse would cut-off at around 23,000 A or a 1,200 A fuse at 70,000 A. An oil circuit-breaker, on the other hand, because of the inertia of its moving parts, may not break circuit for 10 to 25 cycles. The full method by which the fault values, possible on a certain system, can be calculated is too complex and extensive to cover here, but sufficient has been said to show that some knowledge of this subject is essential to all factory electrical engineers. A leaflet (PA.88:10) recently published by the Belmos Co. Ltd., of Bellshill, Lanarkshire, compresses into six pages the essentials of the subject in a clear and concise manner. For those who wish to progress farther, another short study, "Simplified Short-circuit Calculations," is being prepared for early publication.



Cut-off currents for Type T English Electric h.r.c. fuses where peak is 2·55 times r.m.s. symmetrical value

Tarmac mixing by auto-control

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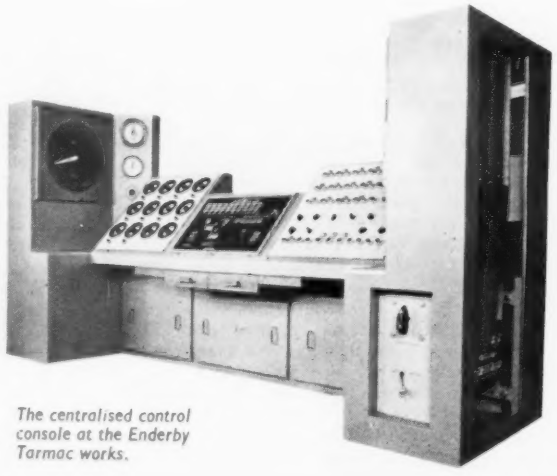

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Short-circuit protection on factory systems

THE incidence of short-circuits on well-maintained factory systems should be few and far between, but, on the odd occasion when they do occur, thermal and magnetic stresses set up in the conductors, both in the cabling and switchgear, can be responsible for quite considerable damage. It is important for the factory engineer to have some idea of the magnitude of such forces and the limits to which short-circuit currents will peak with fuses and breakers of different ratings, and located at various positions on the factory distribution system, so that he may position and select his protective devices with a reasonable degree of intelligence.

A well-known formula for the maximum forces set up between two circular conductors is:

$$F = \frac{5{\cdot}4 \times I_p^2}{10^7 \times S}$$

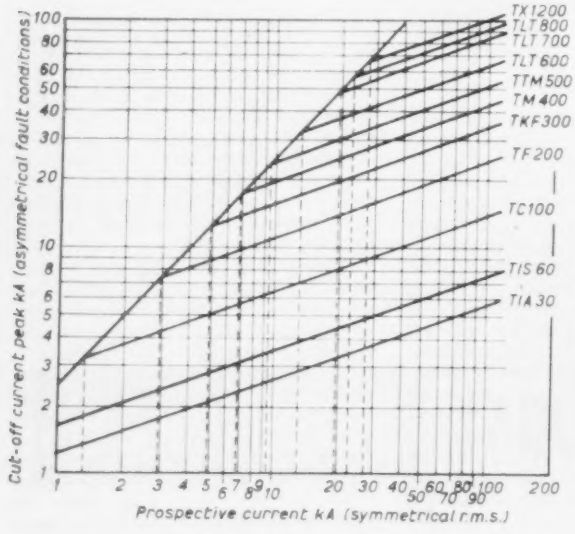
where F = force in lb/ft run

I_p = initial peak amp

S = spacing between conductors, in.

That is to say, the vital factor is the current in the circuit rather than the available MVA from the transformer or alternator supplying the circuit. The low power factor which accompanies short-circuits, usually of the order of 0·3 but if adjacent to the transformer possibly as low as 0·15, means that the current may be 2-2½ times the r.m.s. value of the symmetrical current and this peak will be reached within the first or, at the most, second cycle.

One of the merits of the h.r.c. fuse is that it exhibits a prospective "cut-off" value at which it will interrupt the current within half a cycle (0·01 sec). By choosing a suitable rating, the engineer can ensure that the peak short-circuit current is never reached. For example, a 25 MVA 440 V system will have a symmetrical peak current of 33,000 A, but at 0·3 p.f. it will be 66,000 A. A 30 A h.r.c. fuse will cut off at approximately 3,900 A, whereas a 300 A fuse would cut-off at around 23,000 A or a 1,200 A fuse at 70,000 A. An oil circuit-breaker, on the other hand, because of the inertia of its moving parts, may not break circuit for 10 to 25 cycles. The full method by which the fault values, possible on a certain system, can be calculated is too complex and extensive to cover here, but sufficient has been said to show that some knowledge of this subject is essential to all factory electrical engineers. A leaflet (PA.88:10) recently published by the Belmos Co. Ltd., of Bellshill, Lanarkshire, compresses into six pages the essentials of the subject in a clear and concise manner. For those who wish to progress farther, another short study, "Simplified Short-circuit Calculations," is being prepared for early publication.



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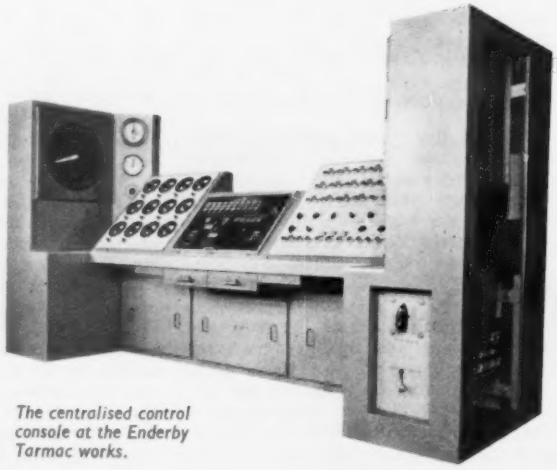

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Hall type using a pressure vessel of about 70 ft diameter 4 in. thick. Considering such a reactor and assuming economies that could obviously be made, he suggested that the capital cost should come down to about £100/kW with a generating cost of around 0·52d per unit. The initial generating cost estimated for the AGR showed little immediate advantage over such a design, yet Sir Chistopher urged that all logic and history suggested the necessity to move forward to the type which gave the prospect of using higher temperatures. For this reason he suggested that there would probably be a period in which orders for AGR stations were interspersed with orders for the Calder Hall type, until the more technically advanced AGR showed a clear operating cost advantage. Sir Christopher repeated the figures that he gave in Madrid of a break-even occurring between 1966 and 1970 depending on the load factor at which the station operated.

Research

For coal fired stations, available figures suggested that research and development costs were of the order of 5% of the capital value of the plant, whereas for the nuclear side of the CEGB nuclear stations it seemed improbable that research and development costs, if effort was maintained on its present level, would be less than 30%. It was probable that by the time the AGR came into use the research and development expenditure on the Windscale prototype would be of the order of £30 million and this was only one part of the effort required. Yet it was possible that the number of power stations of this type to be built by the CEGB would be less than ten.

By the mid-1970's designs would be reaching the limit of temperature and neutron intensity for which graphite could be used as irreplaceable moderator, Sir Christopher forecast, and reactor types would be necessary which permitted replacement or reconditioning of the moderator. The high temperature gas cooled reactor in the project stage at Winfrith Heath was an effort to meet this problem by using graphite as the canning material, so that it was replaced as the fuel elements were changed. Using enriched uranium in ceramic form in a semi-homogenous system, this reactor ought to make it possible to achieve temperatures of over 1,000°C in the heat cycle. If such a system could not be evolved, the alternative would be to use heavy water as the moderator with probably steam instead of carbon dioxide as a coolant. American development had generally been on the lines of water moderation and as they develop higher temperatures in the heat cycle they would probably be forced to use steam cooling. Thus it might happen that the two independent streams of development, starting so far apart, would have flowed logically together.

Meanwhile if the present rate of technological progress in the nuclear field was to continue, there was little prospect that research and development costs will fall below the 30% of capital expenditure. How long could the electrical industry justify this, asked Sir Christopher. He suggested the reasonable aim of continuing the high rate of advance of nuclear technology to the point where nuclear power broke even in cost with conventional power. At that time there would be freedom of manoeuvre in a three-fuel economy. After that date, however, which was not remote, it would be reasonable to think that further research on reactor technology should be justified by savings which could be expected to arise from its industrial application. It was interesting to speculate how much the downward trend in the cost of conventional power could be increased with as great a research and development effort as its nuclear rival had received. Such a consideration would probably lead to a demand for a changed distribution of effort in a few years' time.

Royal Society Tercentenary

DISTINGUISHED men of science filled the Albert Hall last Tuesday for the formal opening of a week's celebration by the Royal Society of its Tercentenary.

Fellows and foreign Members of the Society were joined by over 200 eminent scientists representing overseas national academies of science and other organisations including 50 from the Commonwealth to hear the opening address by H.M. The Queen. Her Majesty was accompanied by H.R.H. The Duke of Edinburgh, and it was fitting that both these Royal Members should be present for the subsequent admission to the Society, as a Royal Member, of H.M. King Gustav VI Adolph of Sweden.

After his formal admission, King Gustav, who was accompanied by H.M. The Queen of Sweden, signed the Charter book which was presented to the Society by King Charles II and which bears the signature of nearly every Fellow admitted since the Society's foundation in 1660. The formal admission of King Gustav was followed by the Presidential address by Sir Cyril Hinshelwood, O.M.

In the three hundred years since the Society's foundation, said Sir Cyril, a vast gulf of scientific knowledge has separated us from its founders. 'Yet, temporarily, we are not so far removed from them as not to be able to picture in imagination the King himself, and the echoes of his witty sallies have not yet grown faint'.

Today the founders are regarded with something approaching filial piety and warm respect, but in their lives they were not so well regarded by many of their contemporaries. Complaints indeed made against the Society were of 'atheism, impiety and subversion, or if not the practice of or countenancing of these things, then at least the creation of a philosophy which would lead weaker brethren into evil thoughts or be used by the wicked as a cloak for their depravities'. Even today misfortunes and defects laid to science range from intellectual arrogance to social obscurity, but the origin for these comments lie rather with emotion than with reason.

'In the last hundred years, the pattern of life has been transformed. Things which in Charles II reign would have seemed like a dream of visionaries or indeed the impostures of charlatans are now part of common sense'. 'The not infrequently disreputable operations of chemists grew into the science of chemistry. The patient genius of Faraday showed that the obscure and apparently unrelated curiosities of electricity and magnetism were unified, although he had little premonition of electric railways, of television or of automation.'

'What is to be the future of Science? Extrapolation of history is impossible, perhaps in principle, certainly in practice. The task of men of science is clear. It is to go ahead undeterred by any of the uncertainties. A great upheaval of ideas may come with a complete re-orientation of science in its relation to philosophy and to the conception of possible worlds, but we know neither the day nor the hour.'

CIGRE 1960

Rotating Machines

This week our report on CIGRE is confined to the generator discussion group. Discussion at the 1960 session centred on the unusual aspects of generator operation rather than design and operation under normal conditions.

Generators

THE practice of running generators asynchronously has only recently received attention in this country, although it has been accepted in the USSR and a few other countries for some years. This subject and the associated one of improving excitation response occupied most of the CIGRE session on generators, but there was also considerable discussion on relative merits of a.c. and d.c. testing for rotating machine windings. However, this subject was clearly complex and required so careful an analysis of test results that no general conclusions of its value was yet considered practicable.

Test Experience

Tests, whether a.c. or d.c., which may yield information about life to be expected of insulation or presence of incipient faults would be of great interest to many power system operators who may well have machines running up to 40 years old.

A report setting out experience with a.c. and d.c. tests was submitted this year by Messrs RITTER and WOHLFAHRT (Switzerland). A.C. tests, it was claimed, could only indicate that a particular coil was either sound or faulty, whereas certain d.c. tests gave very good results as manufacturing standards and were also claimed by some to be ideal as checks on ageing. Unfortunately, it would seem virtually impossible, except within narrow limits, to relate a.c. conditions to d.c. test results.

In France, the present trend was to reduce the severity of dielectric tests and to attach greater importance to quality control. In making these comments, MR LEROY said that no simple relationship between a.c. and d.c. could be hoped for and it was necessary to rely only on a.c. tests. He did not think tests based on assessment of discrepancies from Ohm's law provided much useful information. On the other hand, a high voltage d.c. test carried out twice per year could detect incipient faults.

An a.c. high voltage proof test after a period of service operation was claimed by MR WICHMANN (Germany) to give useful information. He also preferred a.c. tests and thought the d.c. high voltage test only of occasional value.

Referring to the use of tan δ testing, MR LANG (France) thought it important to stress that the tests could only be safely used in comparing performance of similar chemical compounds and not for determining the relative merits of different insulating materials.

Tests using d.c. were favoured by MR STROMBERG (Sweden) on the grounds that, properly used, they could avoid breakdowns. However, he thought acceptance tests should only be a.c. and this was now the policy of the Swedish Power Board.

Obtaining a relating factor between a.c. and d.c. tests, MR WOHLFAHRT agreed, was difficult. He thought the usual a.c. tests were needed and he also thought the tan δ test absolutely necessary as a check on manufacture since it gave indication of the sum of corona, insulation and surface leakage currents.

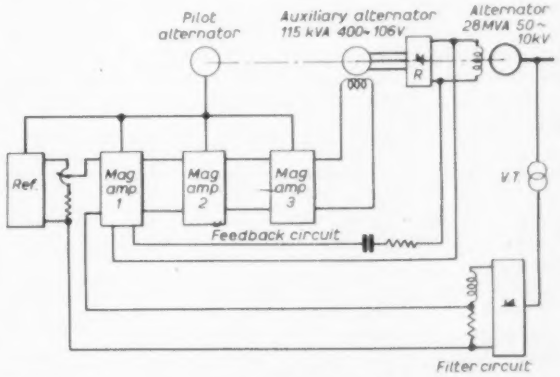
The chairman, MR LAURENT (France), commented that the tan δ test seemed to be a very powerful method of assessing insulation condition. However, although interesting results had been quoted in the report for both h.v. and l.v. d.c. tests, it was not possible at present to relate them clearly to a.c. performance.

Rectifier Excitation

Considerable interest was shown in two reports concerned with rectifier excitation of large machines. One of these outlined tests made in Italy, using magnetic amplifiers and silicon diodes to control the output of a 28 MVA alternator, while in the other paper a grid-controlled mercury arc installation was described, used for exciting 46·7 and 20 MVA alternators for a rolling mill in Germany.

In both cases rapid response was obtained and, for the rolling mill, it was stated that voltage variations were reduced from 7% to ½% provided the load on the supply varied in not less than 0·1 second.

Referring to the semiconductor installation, MR SIMONETTI (Italy) said the discussion had shown that the most important question was the highest stress to which the rectifier cells would be subjected in use. In his paper describing the installation, he concluded that excitation derived from a synchronous generator feeding a semiconductor rectifier gave a dynamic response between



28 MVA alternator with semiconductor rectifier R, supplied from 400 c/s auxiliary alternator. The auxiliary alternator is excited through a 3-stage magnetic amplifier from the pilot alternator which also supplies the Zener-diode-stabilised voltage reference

that of a conventional exciter and one using controlled rectifiers. For high outputs and speeds, semiconductor excitation provided a simpler and more robust method than a rotary exciter and dispensed with the need for large reduction gearing between the alternator and exciter.

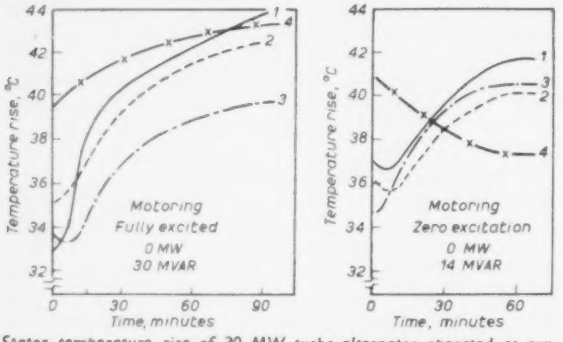
To reduce the size of the equipment, 400 c/s was selected for the excitation alternator frequency feeding the semiconductor rectifiers. The choice of this frequency was approved by MR BIFFI (Italy) who thought an even higher frequency would be practicable and also suggested the use of an oscillating flux generator.

Alternators as Synchronous Condensers

At present, the average reactive power required by consumers on the British grid was 0·4 MVAr/MW plus a further 0·1 MVAr/MW consumed by the system. This power was now generated at 275 kV, but for more economical use of plant it would be necessary to provide it either from static capacitors or from synchronous condensers. MR POWELL (GB) referred to CEGB tests carried out on 25 and 30 MW turbo-alternators to ascertain their suitability for use as synchronous condensers.

Consideration of the economic aspects of using alternators as synchronous condensers showed that they were able to provide a reactive power reserve which, in Britain, could be useful for many years to come. For a power station which would normally be manned, operation of the alternators as synchronous condensers cost less than running separate synchronous condensers.

The ability to change from reactive power absorption to generation quickly, which was possible with modern fast-acting voltage regulators, also gave advantages under



Stator temperature rise of 30 MW turbo-alternator operated as synchronous condenser taken by the CEGB: 1, 2, 3, temperature recorded by thermocouples, spaced 120°, at the turbine end of the stator. 4, temperature at centre of stator core iron. The test followed a 4-hour run as a generator with 60% rated load and 75% excitation

transient system conditions. Calculations have shown that tripping of one of the three 275 kV lines feeding the London area would require a 25% increase in transfer of reactive power. This implied that reactive power reserve required of a system may frequently be higher than the active lower reserve.

Local alternators operating as synchronous condensers could supply this power and they would also assist restoration of system stability after a disturbance by reason of their lower transient reactance and higher inertia constants when compared with synchronous condensers.

Tests made on the two turbo-alternators showed that no serious difficulties arose when they were operated as synchronous condensers. No overheating occurred in the turbine provided full vacuum was maintained and steam was supplied to the ejectors and glands. However, on one of the machines it was necessary to control the exhaust casing temperature by water injection. With the alternator motoring, the steam consumption of the turbine was as low as 17% of the normal no-load consumption.

Temperature rise and performance of the alternator was also satisfactory when operated with reduced excitation. No excessive core heating was noted by thermocouple measurements, though the paper commented that machines with magnetic end bells may experience overheating. A high rate-of-response voltage regulator permitted operation in the dynamic stability region up to rotor angles of 130° even, on one machine, to 140°. On this machine reactive power output was 31% higher than when operating with 10° rotor angle, clearly indicating the value of operation in the dynamic stability region.

MR EASTON (GB) said tests carried out on a machine with magnetic end bells had also shown operation without excessive temperature rise. Commenting on tests carried out by the CEGB, MR JAMES (GB) said that manufacturers had been sceptical of operation without steam on the turbine but tests had shown that, provided sufficient vacuum was maintained, operation was satisfactory.

Asynchronous Operation

A paper by Messrs MAMIKONJANTZ and SYROMJATNIKOV (USSR) outlined studies on asynchronous operation for the quick restoration of operating conditions after clearing a fault which had caused loss of synchronism.

Two other papers also dealt with asynchronous operation. A Japanese paper showed that it was possible to calculate optimum slip values below which synchronisation occurred with the minimum of system disturbance, and a paper from Czechoslovakia analysed the influence of rotor resistance on starting performance of salient pole synchronous machines.

Short-time asynchronous operation of excited generators was used in the Soviet Union for quick restoration of supply after a fault accompanied by loss of stability. If a large enough impedance exists between networks, non-synchronous reclosure had been used followed by asynchronous operation of some parts of the system.

Regulations in the Soviet Union permitted solid rotor turbo-generators to be operated out of step for 30 minutes after losing their field, if the required reserve reactive power existed in the system and if their stator current did not exceed 110% of rated current. This did not apply to water-wheel generators which had to be disconnected from the system. However, water-wheel generators were often resynchronised successfully by closing on to the line on restoration of the field supply. On the Volga hydro-electric scheme, a special device was installed which disconnected some of the water-wheel generators if synchronism with the Moscow system was lost. As a result, the voltage on the remaining water-wheel alternators would rise, leading to an increase in the average resynchronising torque and improving conditions for resynchronisation.

Loss of synchronism was allowed in many cases where complicated and expensive equipment would be necessary to avoid it. Automatic regulation and excitation forcing was widely used and, in general, short-time asynchronous operation had been proved to give no damage to either generators or system.

Tests on more than 40 machines showed that the average asynchronous torque on solid rotor two-pole turbo-alternators corresponded to rated torque at a slip as low as 0·2 to 0·7%. Active load limitation with loss of excitation and asynchronous operation was limited by stator current rather than rotor losses.

Among the problems discussed were the merits of three-phase reclosure between isolated network elements;

whether optimum resynchronisation conditions existed for a particular network and whether exciting the generator during asynchronous operation aided resynchronisation.

In the USSR, Rumania and Poland, unexcited generators were run up asynchronously and excited when they approached synchronous speed.

This method had also been used to a limited extent in France, and it was stated to considerably simplify automatic power station starting up. However, it may cause system disturbances and also stress machine windings.

In the United States, according to MR CONCORDIA, systems are designed with reserve capacity, permitting a machine to be lost without losing load. He thought the best solution was to trip a machine if it fell out of step and added that shaft stresses were often the limiting factor to be considered.

MR AYLETT (GB) said the Russian report gave an excellent summary of performance under asynchronous conditions. For large systems, self-synchronisation was practicable. In Britain, a factor to be taken into account was the strong iron saturation effects at high slips. Entirely satisfactory, was how MR EASTON (GB) described resynchronising tests carried out about 18 months ago on a 60 MW hydrogen-cooled machine.

A method of starting synchronous condensers asynchronously by connecting them to a low-speed turbo-alternator set, running the set up to near synchronous speed and then synchronising the condenser with the system was described by MR HORSLEY (GB). After synchronisation the pilot turbo-alternator could be shut down. The advantage of the method was that only power to supply losses and to run the condenser at speed was required from the pilot turbo-alternator.

An important case for asynchronous operation, mentioned by MR MILLER (GB), was in underdeveloped countries where hydro stations may well operate at one end of a single-circuit line with little generating capacity at the receiving end.

Although agreeing with MR CONCORDIA on the preferable method of shutting down a machine which had dropped out of synchronism, MR MAMIKONJANTZ said satisfactory performance depended generally on the system rather than the generator. Asynchronous operation was very often possible without damage to the machine. Tests had shown that temperature rise was, in general, not excessive, although it was preferable to disconnect end rings from the rotor body. He thought great benefit would be derived if asynchronous tests were conducted in other countries to make more data available.

The meeting closed with a discussion on the economic aspects of reactive power generation and the relative merits of capacitors, synchronous condensers and use of turbo-alternators as synchronous condensers.

PRESSURE PILING TESTS

WHEN an explosion occurs in one of two chambers interconnected by a pipe of relatively small bore, the pressure in the second chamber may rise to considerably greater values than that which would be reached in a single chamber of the same volume. This effect, termed "pressure piling," has been recognised for many years, but it has taken on enhanced practical importance recently in connection with design of flameproof enclosures. The ERA has recently published a report* on experimental work being carried out at the Safety in Mines Research Establishment, Buxton, to determine the effect of the interplay of dimensions of the various compartments of pressure.

Background to the work must be the ignition of an inflammable gas mixture in a simple enclosure. In this case, the peak pressure generated varies approximately linearly with the pressure of the gas before ignition. If the mixture is rendered turbulent before ignition, maximum pressure is reached more quickly, but it is not appreciably increased. When there are two or more compartments connected in some way, the explosion in the first compartment is believed to expel unburnt gas into the second compartment ahead of the flame front. This compresses the gas in the second chamber and makes it turbulent, and in due course causes it to ignite, producing the high pressure characteristic of pressure piling.

In the test described, the explosion of a mixture of 3% pentane vapour in air in a cylindrical vessel of 510 cu in. capacity caused pressure piling in a 38 cu in. capacity cylinder connected by a pipe whose length and bore could be varied.

Piezo-electric gauges were used to record pressures in connection with a c.r. tube and a revolving-drum camera. Gas mixtures were ignited by a low tension electric fuse head in the larger chamber.

Discussing the results in general, the report notes two characteristic pressures in the smaller chamber. There is a steady increase for some time after the explosion to a relatively low pressure (primary pressure) followed by a rapid rise in pressure to a value typically ten times as much (peak pressure). Variation in the diameter and length of the pipe is effective through altering the volume of unburnt gas displaced into the smaller chamber. In fact, the primary pressure is found to increase asymptotically with increase in bore of the connecting tube. There is not the same relationship for peak pressure, because the smaller chamber is effectively vented by the connecting tube. Consequently, maximum peak pressure is obtained not when the diameter of the connecting tube is such as will yield maximum primary pressure, but at some smaller diameter at which the effect of reduction in primary pressure is off-set by that of reduced loss of energy during the explosion.

The tests confirm this effect, a $\frac{3}{4}$ in. bore tube giving the maximum pressure of about 500 lb/sq in. for the vessels used with primary pressure of about 50 lb/sq in. A relatively low value at peak pressure is associated with wide bores, only 200 lb/sq in. for a 1 in. bore. Peak pressure in this case is followed by rapid decay of pressure and the explosion time is long, so that in the experimental conditions used a wide bore connecting tube lessens both severity and duration of the explosion in the smaller chamber.

The report makes clear that the test results are strictly valid only for the conditions chosen for study. Peak pressure is generally independent of length of connecting tube and depends on the bore of the connecting tube.

* Tech. Report D/T109, Pressure Piling in Compartmented Enclosures, Pt. 1. "Effects of bore and length of connecting tube in explosions of pentane/air mixtures," by T. J. A. Brown.

equipment for industry

Capacitance level relay

TWO versions of a capacitance level relay have recently been introduced. In one version the relay is integral with the probe unit, of which several types are available, and in the other unit the probe is connected to a wall-mounting relay unit by coaxial cable. The relay has sealed triple-pole contacts suitable for 5 A at 250 V a.c. and incorporates transistorised printed circuitry. Sensitivity of the instrument is said to be better than 0·1 pF and the differential of the relay may be varied between 1 and 25 pF. *Bailey Meters and Controls Ltd., Purley Way, Croydon.*

Miniature relay for printed circuits

ESPECIALLY designed for printed circuits using the standard 0·1 in. grid, is a new relay which may have either four changeover contacts for d.c. operation, or three changeover contacts for a.c. operation. The relay measures only 1¼ in. by 1⅛ in. by 1⅞ in. and single or double-wound coils are available. *Magnetic Devices, Newmarket, Suffolk.*

Off-peak oven heating

CONSIDERABLE reductions in cost of operating electric ovens for drying out, impregnating and stoving are claimed for a development of the "Supa-stor" thermal storage heater. Two important features of the heater are the ability to control oven temperature by a damper system which may be manually or automatically controlled and the use wholly, or in part, of off-peak tariff supply. The "Supa-stor" system can be adapted to many existing types of ovens. It consists of electrical heating elements enclosed in thermal storage oxides which are, in turn, contained in an insulating case to prevent heat loss by radiation. By raising the temperature of the "Supa-stor" during night off-peak periods, it is claimed that for small consumers the cost of electricity consumed may be halved. The method has so far been applied to stoving ovens operating at temperatures up to about 250°F. It has the further advantage that oven temperature quickly reaches the operating value, avoiding the long delay between lighting an oven and its reaching the desired operating temperature. The "Supa-stor" heat storage units can be fitted to ovens heated by electricity, gas or other fuels. *Dulrae Ltd., Spur Rd, Feltham, Middx.*

A "Supa-stor" electrical thermal storage heater is fitted in the lower compartment of this stoving oven. Quick heating with control and use of off-peak tariff consumption are two advantages claimed for this method of heating

Small variable speed motor control

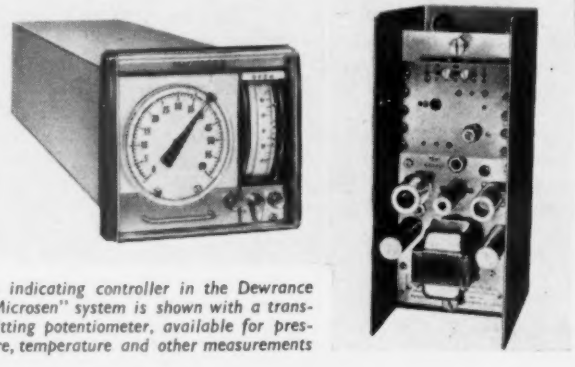
SEVEN sizes of "Variac" controllers comprehensively provide for small motor speed control from 1/15 to 1½ h.p. The controllers are available in self-contained or split models. The self-contained model includes "Variac," reversing switch, pilot light and a circuit-breaker for ratings above ¼ h.p. Connections to this unit are made through a plug and socket. The split version contains only the rectifier transformer and choke with separately mounted "Variac," enabling the user to incorporate his own controlling equipment. Dynamic braking is included in all models and, for motors above ⅛ h.p., a dual control enables different forward and reverse speeds to be pre-set. The "Variac" supplies the motor armature through a selenium rectifier and smoothing inductor. The field is supplied through a separate rectifier. Dimensions of the self-contained, dual-speed control units vary from 13 in. by 9⅜ in. by 7⅞ in. for ⅛ h.p. to 17⅛ in. by 28½ in. by 13½ in. for 1½ h.p. motors. The same company have added a compact power supply for laboratory instruments to their "Unit" range. It has an output of 300 V d.c. at 50 mA and 6·3 V 3 A a.c. The total weight of this unit is 5 lb. *Claude Lyons Ltd., Valley Wks, Hoddesdon, Herts.*

Colour for ceiling lighting

TWO variations on the popular module form of plastics diffusing panel for ceiling lighting have recently been introduced. 2 and 3 ft panels are now available in yellow, green, red and blue to give heightened decorative effects in showrooms, restaurants and other locations. These coloured modules are interchangeable with white standard modules and fit into fluted light alloy supporting tracks. Their effectiveness for display lighting may be enhanced by the second introduction, a module, either white or coloured, carrying a recessed spotlight. The "Highlight" module conceals the connections to a centrally mounted directional spotlight, which may be up to 100 W. *Lumenated Ceilings Ltd., Alliance Hse, Caxton St, S.W.1.*

Process control

UNDER the name "Microsen," Dewrance are marketing an electronic system for process control. D.C. signals derived from transducers give indication of pressure, differential pressure, flow and temperature on recorders, or indicating controllers. Three types of controller are available, a miniature strip-chart, an indicating controller and a vertical scale controller. All the units operate with an input of between 1 and 5 mA d.c. with an accuracy of ±½% of f.s.d. Controllers may be used for proportional plus integral plus derivative control. The d.c. signal proportional to flow, pressure or temperature is derived from a bridge circuit whose balance depends on a mechanical balance beam system which may be altered by the measured quantity. Each transmitter requires four wires, two for power supply at 115 V at 50 or 60 c/s and two for the d.c. signal. The transmitting potentiometer, which determines the control signal amplitude, may be mounted in an explosion-proof container if required. The versatility of the system enables it to be used for thermocouple inputs, gas analysers, or strain gauge measurements. *Dewrance and Co. Ltd., Great Dover St, S.E.1.*



An indicating controller in the Dewrance "Microsen" system is shown with a transmitting potentiometer, available for pressure, temperature and other measurements

for the electrical trade

Creda spin dryer reduction

THE "Debonair" Creda spin dryer has been substantially reduced in price from £31 1s 7d to £23 2s including purchase tax. The cut took effect from 1 July. *Simplex Electric Co., 28 Binney St, W.1.*

Low cost shaver

AN electric shaver for £2 17s 6d tax paid will be introduced at the end of August. This shaver, "New Sportsman de Luxe," is of the vibrator type, with a "shim" head—a perforated metal shield for directing stubble on to the cutting blades. It has a plain black and white body, matching the gilt-framed presentation box. The a.c. motor, which runs on 220/240 V, is radio and TV suppressed. "New Sportsman," supplied with the usual brush for cleaning and ample flex, will carry a 12-month guarantee. *Chilton Electric Products, Hungerford, Berks.*

Self-drilling fasteners

EXPANSION fasteners with "self-drilling" bores for fixing into concrete and masonry, "Terriers," are now available. The fasteners, which can be used with impact hammers or mandrels virtually drill their own holes. They have grip lock expanding flanges which carry eight hard cutting teeth for penetrating brick, stone, concrete etc. Once the hole is bored the fastener is removed whilst the hole is cleared of grit, a hardened steel expanding plug placed in the gripping end, the fastener replaced and screw inserted. They are internally threaded to take ¼, ⅜ and ½ in. Whitworth screws. Prices are from 1s 2d to 2s 7d for hand mandrel types and 1s 4d to 3s for use with impact hammers. *Ramset Fasteners, 788a Finchley Rd, N.W.11.*

"New Sportsman De-luxe Shaver," only £2 17s 6d, tax paid

TRADE PUBLICATIONS

POULTRY AIDS.—Pamphlet describing thermostatically controlled infra-red brooder units, broiler house electronic control units and ventilation control units. Electronic Poultry Aids Ltd., Kimpton, Hitchin, Herts.

GLACIER.—Designers Handbook No. 2 on dry bearings and materials. The Glacier Metal Co., Alperton, Wembley, Middx.

THOMAS.—Catalogue R and Price List of light fittings by Frederick Thomas and Co., Everton Bldgs, Stanhope St, N.W.1.

EEV.—Valve Replacement Index booklet from English Electric Valve Co., Chelmsford. Booklet on CR 192 VHF transmitting tetrode, booklet on voltage stabilisers and reference tubes.

BRIBOND.—12-page brochure describing manufacture of printed circuits, giving details of resistance characteristics, etc., of copper clad laminate. Bribond Ltd., Burgess Hill, Sussex.

PURPLE PEEPER.—Large folder describing the Ultra-Vision flame detector. Honeywell Controls, Ruislip Rd East, Greenford, Middx.

HONEYWELL.—Catalogue 84, heavy duty limit switches. Booklet on Aquatrol electronic control systems for low pressure hot water heating systems. Leaflet on control systems for tempered ventilating plant. Honeywell Controls Ltd., Ruislip Rd East, Greenford, Middlesex.

N AND Z.—Publication B/17, 13-page booklet on domestic barometers. 12-page booklet, List No. B/16/2, on binoculars and telescopes. Negretti and Zambra, 122 Regent St, W.1.

NEWALLS.—Brochure illustrating insulation at Chapelcross nuclear power station. Newalls Insulation Co., Washington, Co. Durham.

MS.—Technical leaflet, G/14, Edition 1, March, 1960, on silicone lubricating fluids and greases, by Midland Silicones, 68 Knightsbridge, S.W.1.

STC.—Technical publications: D/104, Ed. 1, on lightweight headphone sets; MQ/104, Ed. 1, on quartz crystals; C/PA20, Ed. 4, on 4037 moving coil microphone; MC/104, 6 and 7, Ed. 1, on electrolytic, polystyrene and oil filled paper capacitors. Application Report, MK/143, "D.C. to D.C. Transistorised Converters," by R. A. Holme. Standard Telephones and Cables, Transistor Div., Footscray, Kent.

KENT.—Pub. 2023, May, "Instrumentation and automatic control of reheating furnaces." George Kent Ltd., Luton, Beds.

BRISTOL ELECTRONICS.—Technical leaflets on computing equipment, test equipment, data processing equipment, GAV amplifiers, heating and loading equipment, by Bristol Aircraft Ltd., Filton Hse, Bristol.

FORAGER MINOR.—Leaflet describing a new battery electric fork lift truck by A. Hirst and Son, Crescent Wks, Meadow La, Dewsbury.

"Aironer" price

THE price of the "Aironer," an automatic ironing tray featured on this page in the 23 June issue, has been reduced to £9 19s 6d tax paid. The price was originally described as £10 list, plus purchase tax. *Burflex (Aldershot), Brierley Hill, Staffs.*

Clock-light combination

AN alarm clock and a bedside lamp in a single unit form an attractive fitting soon to be introduced. It consists of a "Sectric" alarm clock and a simple table lamp fitting on a common oval base of white plastics. The lamp standard is actually a part of the base and is thus less likely to be knocked over than an independent fitting. It has a tall lavender coloured shade.

This handy combination, called "Autorise-Alarmalite," will sell at £4 15s only, including purchase tax. Marketing should begin within the next two weeks. *Smiths Clock and Watch Division, Sectric Hse, Waterloo Rd, N.W.2.*

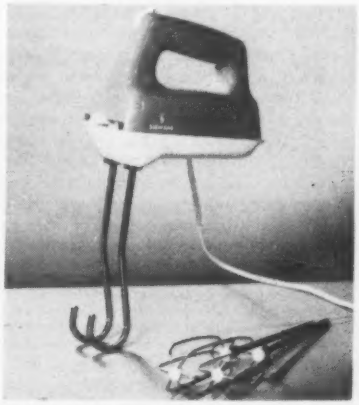
Lamp price cuts

ASCOT announce that their "Double-Life" lamps, 40-60 W and 70-100 W, are reduced by 4d each as from 18 July. These lamps now sell at 1s 7d and 1s 10d, tax paid. *Ascot Lamps and Lighting, Arcola St, E.8.*

German hand mixer

AN attractively styled hand-held food mixer, the Siemens "Rapid Mixette," is being imported into this country from Germany. This mixer, available in three colours, has double paddles and three speeds: 500, 700 and 1,000 r.p.m., controlled from a switch placed conveniently on the bend of the handle nearest the thumb. It is supplied with the standard accessories—whisks and doughhooks which can, of course, be inserted singly into the head.

The motor is universal and protected against overloading by a replaceable fuse. "Rapid Mixette" has a white underside with blue, yellow or beige top and handle. Price, including purchase tax, is £10 10s. Cat. No. KSM 300. Distributors: *Lonor Ltd., 1 Maddox St, W.1.*



The "Rapid Mixette," price £10 10s 0d

News of the Week

TWO WELL-KNOWN FIRMS TO AMALGAMATE

Hackbridge & Hewittic merging with Switchgear & Cowans

TWO more major electrical firms are to amalgamate: Hackbridge and Hewittic Electric Co. Ltd. and Switchgear and Cowans Ltd. Directors of both concerns are recommending the merger to their shareholders. Earlier this week Peat, Marwick, Mitchell and Co., accountants, were preparing a report which will recommend the terms.

Hackbridge and Hewittic, who manufacture overhead line switchgear and some of the largest transformers and rectifiers, was formed in 1906 with the title of Westinghouse Cooper-Hewittic Co. The title was changed to the present one in 1947 and the company have acquired the Hackbridge Electric Construction Co., New Switchgear Construction Co. and Kartret Switchgear Co.

The firm also have subsidiaries in Canada and South Africa, and only last June acquired over 96% of the capital of Bertram Thomas (Engineers) Ltd. for £505,285. The capital of Hackbridge and Hewittic consists of £350,000 in 4% Preference shares and £1 million in Ordinary shares. For the past five years the net profit after tax, etc., has topped £150,000.

Switchgear and Cowans Ltd., who started business in 1911 and became a public company in 1936, have an issued capital of £450,000 in 5s Ordinary shares. There are four subsidiary companies—Richard Whiffen Ltd. (insulation), Eastnor Electric (diecastings), Sykes and Harrison (castings) and Harvey and Longstaffe (wood and metal patterns, etc.). The company have placed contracts for a new 75,000 sq ft factory at Broadheath, Manchester.

Smiths Industrial Division

A NEW division has been formed by S. Smith and Sons (England) Ltd., parent company of a group in aviation, automobile, industrial, marine and horological instruments, to integrate their activities in industrial products which have formerly been manufactured or marketed by three subsidiaries: Smiths Industrial Instruments Ltd., Kelvin and Hughes (Industrial) Ltd. and David Harcourt Ltd. The assets and undertakings of the three companies will be transferred to the parent concern on 1 Aug.

The undertakings so transferred, together with the relevant manufacturing activities of S. Smith and Sons (England), will form the Industrial Division of the Smith group, with the trading style "Smiths Industrial Division." The three subsidiaries will cease to operate as such.

General manager of the new division will be Mr W. M. Cann, and the head office will be at Chronos Wks, North Circular Rd, London N.W.2.

More Trade with Japan

A NEW trade agreement has been signed between Japan and the UK providing for import quotas and liberalisation of a wide variety of goods during the year ending 31 March, 1961.

Among electrical products which may now be imported from Japan under quota are: transistorised radio sets, gramophones and radiograms (£200,000); grams and radiograms other than transistorised (£100,000); radio and television sets other than transistorised (£100,000); and electric clocks for domestic purposes, other than battery wound clocks (£5,000).

Now freed from import licensing control are: fans (other than industrial); hand lamps, torches, etc.; insulating cloth and tape; lamps (filament or discharge, including fluorescent); lighting appliances and fittings; switches, thermostats, vacuum cleaners and attachments; watt-hour meters; industrial instruments; refrigerators and refrigeration machinery; and switchgear and switches (including timing devices).

Battle for Temco

LATEST step in the battle for control of the Telephone Manufacturing Co. between Pye Ltd. and a consortium of seven major electrical manufacturers was the raising on Monday of the latter's bid. They now offer 15s cash for each 5s Temco share, and state that "the potential value of the TMC business does not justify a price in excess of 15s." This followed Mr C. O. Stanley's (chairman of Pye) talk with Mr Reginald Maudling, President of the Board of Trade, last Friday.

Mr Stanley later said: "I told the President that I had not come to ask him for help for my company to join the ring. Rather, I had come to ask him, in the interests of the export trade in telecommunications and telephone equipment, to destroy the ring—first, because it was wrong; and, second, because it was disastrous to our export efforts."

A Board of Trade spokesman said that Mr Stanley had told Mr Maudling that he was very interested in exports. "If he lets Mr Maudling have a memorandum on how he can increase exports, Mr Maudling will be ready to discuss the matter with the Postmaster-General." A detailed memorandum is being prepared.

Meanwhile, the Postmaster-General was asked in the Commons last week if he would now abandon the present method of ring purchasing by the GPO to assist the export trade in telephone equipment. In reply Mr Bevins said: "No. In my view the existence of Post Office bulk purchase agreements with certain firms has fostered technical progress and assisted the export trade in telecommunications equipment."

Managerial pay claim in . . .

A CLAIM for a substantial pay increase for the managerial and executive staff in the electricity supply industry has been submitted by the three staff associations. They claim that the recent pay award to the NJC clerical and administrative staff (ELECTRICAL TIMES, 7 July) creates a completely anomalous situation so far as the managerial scales are concerned.

Apart from backdating that pay rise to 1 Dec. last, it is pointed out that the NJC award has created the anomaly that in some cases the higher grades of the clerical personnel are now receiving higher salaries than their managerial grade chiefs.

. . . and manual workers' claim starts again

THE pay claim of the manual workers in the electricity supply industry is back to where it started; however, discussions on a wage review are expected to take place at today's (Thursday) meeting of the NJIC. In effect they will take up the matter where it was left off last April after a failure to agree by the two parties.

That is the outcome of the findings of the Special Arbitration Tribunal announced last Friday. Even the three members of that tribunal could not agree and the matter was accordingly decided by the chairman, Mr Roy Wilson, Q.C.

He decided that the claim for a wage increase for the manual workers had not been established. He has recommended that information should now be gathered concerning the earnings of employees in the shorter week (hours were reduced from 44 to 42 on 1 Feb.), and that both sides should begin a pay review immediately with a view to making such pay adjustments as might be jointly agreed.

An unofficial shop stewards' committee is now seeking support for a national strike unless a minimum wage of £10 a week is granted.

P.M's Export Pep Talk

THE Prime Minister has made an appeal to traders to venture further into export enterprises and to persuade smaller concerns to do likewise. He was speaking at a meeting with leading manufacturers on 18 July arranged jointly by the Association of British Chambers of Commerce, FBI and NUM. Mr Macmillan noted that although exports had risen last year to £10 million per day, there was a real need for improvement. He asked those already engaged in export to increase their sales and those who had never attempted it before to look outwards to foreign markets. Firms could not count on unlimited expansion in home trade since the public desire for variety and the necessity to free trade from restrictions had put our home market wide open to foreign products.

Though the Government had its part to play, he said, it would be disastrous for it to attempt to sell goods for the trader. It could, however, save prospective exporters time, trouble and money if they were to take advantage of the advisory services offered by the Board of Trade.

On the subject of credit he expressed the view that a good market was any country in which goods could be sold *and paid for* in a reasonable time. Though more sales could be made on extended credit—25 years had been mentioned—balance had to be kept with our immediate needs. Export earnings were needed if the standard of living was to be raised, but those earnings were needed now.

Resale Price Maintenance: Caution urged

THE right of manufacturers individually to enforce resale prices should not be disturbed, is the recommendation of the Council of the Birmingham Chamber of Commerce embodied in a report sent to the President of the Board of Trade and to the Association of British Chambers of Commerce.

The report was produced by a special committee set up to examine the implications of any possible change in the system of resale price maintenance at present open to UK manufacturers. This move followed the announcement that the President of the Board of Trade was to institute a departmental fact-finding inquiry into r.p.m.

Among the eight members of the committee, representing industry and commerce, were Mr R. P. S. Bache (George Salter and Co.), Mr R. S. Drake (Wolseley Engineering) and Mr W. E. Kenrick (Archibald Kenrick and Sons Ltd.).

There is little evidence that the abolition of Section 25 of the Restrictive Trade Practices Act, 1956 (which gives manufacturers individual right of action to enforce minimum prices through the courts) would lead to substantially reduced prices in the shops, the report concludes. On the contrary, there is evidence from overseas experience that average retail margins do not tend to decrease in the absence of r.p.m.

Most price-cutting is a temporary method of sales promotion and advertisement rather than a reflection of any increase in efficiency of distribution, the report states. The abolition of r.p.m. would place a premium on quick-selling techniques and low overheads; to this extent it would be likely to lead towards monopoly in retailing and subsequently, perhaps, in manufacturing.

Dealing with consumer protection, the report points out that it is in the public interest that proper service and maintenance should be provided for the ever-widening range of durable goods now being sold. Skilled technicians must therefore be employed by many retailers, who at present can only afford to do so because price-maintained goods ensure a fair profit margin.

The absence of skilled advice may lead to actual danger to life and limb, the report stresses. The installation of heating equipment or the wiring of electrical goods are obvious examples. Under conditions of excessive price competition the less discerning consumer will tend to buy in the cheapest market and the retailer who continues to provide expensive demonstration, pre-delivery and after-sales service facilities is likely to be forced out of business.

Resale price maintenance, even in its present very limited form, works to the advantage of the economy in three ways, the report adds. First, it encourages trade stability and enables manufacturers to plan their forward production. Secondly, it enables retailers to give the public adequate before- and after-sales service. Thirdly, it actively discourages a tendency towards monopolies in the retail trade.

This is not only desirable in itself, but also tends to ensure that manufacturers are not placed in an adverse bargaining position with their retail outlets and that the quality of products is not reduced.

Board of Trade Inquiry "disturbing"

IT was understandable that manufacturers and traders were disturbed about the confidential inquiry into resale price maintenance to be conducted by the Board of Trade, Mr R. Gresham Cooke, M.P., told the Council of the Proprietary Articles Trade Association last week. There had been considerable pressure on the Government to encourage lower retail prices and a reduction in the cost of living, and "it was not surprising" that Section 25 of the Act, enabling manufacturers to enforce resale prices on retailers, had been criticised.

"In these circumstances it is difficult for the Government not to open an investigation, if only to find out whether resale price maintenance, even in its present limited form, obliges customers to pay higher prices than is necessary," Mr Gresham Cooke explained to his audience.

He hoped that officials of the Board of Trade, after they had studied the replies to the questionnaires issued in connection with the inquiry, would be cautious before advising their Minister to recommend Parliament to make any major modifications to Section 25 of the Restrictive Trade Practices Act.

The new station at Harlow Town on British Railways' Eastern Region modernisation and electrification scheme. Up-to-date design and modern lighting serve to "symbolise the new Railway Era," BR comment. The station uses a 53-transistor crystal master chronometer (first to be used in the Region) driving 11 slave clocks, and accurate to within half a second a week. The station, begun early in 1959, was officially opened last week

Another Acquisition

THE share capital of Hall Electric Ltd., of London, exporters, wholesalers and distributors of radio and electrical goods, is being purchased by Grampian Holdings, the Glasgow-based industrial holding and investment company. Price is £463,500 to be satisfied partly in shares and partly in cash.

Factory Equipment Show

SOME 240 firms are exhibiting at the Factory Equipment Exhibition, Belle Vue, Manchester, from 21 Sept. to 1 Oct. next. Claimed to be the first major trade show to be presented outside London the exhibition will cover 150,000 sq ft.

The exhibits will be grouped in separate sections, each corresponding to a major division of industry, including handling, storage, workshop machines, tools and general industrial equipment, heating, power, ventilation, air conditioning, dust and fume extraction, product finishing, instruments and electronics, protective clothing, etc.

In addition, a special industrial procession of 100 exhibitors including representative displays by exhibitors will parade through Manchester on 24 Sept.

Chairman of Newton Abbot Urban Council, Mr H. H. Gribbon, opening the new South Western EB service centre at Newton Abbot recently. Also pictured (left to right) are Cllr H. W. Brockway, Mrs Gribbon, Mr A. W. Allwood (Torbay district manager, SWEB) and Mr S. F. C. Whitmore, SWEB deputy chairman

The Future of Broadcasting

A COMMITTEE of inquiry into the future of sound and television broadcasting in the UK is to be set up by the Government, the Postmaster-General announced last week. Sir Harry Pilkington, chairman of Pilkington Bros. Ltd., the glass manufacturers, and a former president of the Federation of British Industries, is to be chairman of the committee; the names of other members will be announced "as soon as possible."

The terms of reference are :

To consider the future of the broadcasting services in the UK, the dissemination by wire of broadcasting and other programmes, and the possibility of television for public showing;

To advise on the services which should in future be provided in the UK by the BBC and the ITA;

To recommend whether additional services should be provided by any other organisation; and

To propose what financial and other conditions should apply to the conduct of all these services.

The Government have decided, also, that the BBC's charter and licence should be extended from 30 June, 1962, to 29 July, 1964, the expiry date of the Television Act.

G.E.C. MOULDED PLASTICS

THE moulded insulation works of GEC at Witton is now to be known as GEC Moulded Plastics Division. The company have been moulding plastics at Witton for more than 40 years and turn out a wide range of products for various industries, from refrigerator parts and telephones to nylon football studs.

Aids Available to the Farmer

APART from the usual income-tax relief and allowances available under a number of recent Acts, farmers can now obtain various grants and subsidies towards the cost of general improvement on their farms. In many instances these include electrical works and, as a guide to the assistance which can be obtained in this direction, the Electrical Development Association has published a new booklet entitled *Financial Assistance for the Development of Electricity on Farms.*

Within its small compass, the booklet outlines the aid which may be claimed both in respect of the farm and certain dwellings. It is available free from the association, as are two new Farm Electrification Handbooks. Of the latter, No. 6 concerns milling and mixing, while No. 7 covers greencrop drying. Both refer to the practical installation of suitable electrical equipment for the purpose stated.

Scandinavian Link for E.M.I.

AN agreement has been concluded between EMI Electronics Ltd. and the Swedish SAAB Aircraft Co. under which SAAB will sell EMI equipment in the industrial, automation, broadcasting, instrument and special tube fields throughout Sweden, Norway and Denmark through their sales organisation, SAAB Electronics, Stockholm.

At the same time EMI Electronics will market SAAB products in the Commonwealth and other countries. The two companies have also agreed to exchange technical information and licences.

The SAAB Aircraft Co. Ltd.'s range of products includes civil aircraft, helicopters, cars and electronic equipment embracing digital and analogue computers, numerically controlled machine tools, instruments and components.

C.I.G.R.E. 1962

THE 1962 meeting of CIGRE will be held from 16 to 26 May—slightly earlier than latterly, to avoid both Ascension Day and Whitsuntide.

No Import Squeeze

THE recent measures to restrict credit were directed to relieving the pressure on economic resources generally, and were not specifically necessitated by the increase of UK imports in relation to exports, the Chancellor of the Exchequer stated in the House of Commons last week. The increase of imports relatively to exports was only one aspect of the balance of payments situation.

Of the increase of £290 million in imports during the first five months of this year compared with the same period of last year, 3% consisted of food, 27% of basic materials and 70% of manufactured goods, including materials for further processing.

BRITAIN'S EXPORT OUTLOOK ANALYSED

THERE are no "bad" markets among Britain's main customers abroad according to the latest (July) issue of *GEC Export Guide* published last week. Since April last the outlook for UK exports has improved in Finland, Malaya, Singapore, Pakistan, Portugal and Venezuela, but prospects have become less favourable in Belgium. In general, the export outlook for the period July-September, 1960, is good in 23 countries, improving in six, deteriorating in two and unchanged in three, the *Guide* forecasts.

Reviewing the work of GATT, the *Guide* points out that over 80% of world trade is transacted by contracting parties to this international organisation. The first tariff conference in Geneva in 1947 affected 45,000 tariff arrangements between 23 countries which signed 123 tariff conventions between them. At the most recent conference in 1950-51, 58,000 tariffs were eventually reduced or fixed affecting 32 countries which between them accounted for four-fifths of world trade.

The approaching tariff negotiations, involving the three major economic areas of the world—the sterling, dollar and Common Market areas—are likely to be approached with a determination to reduce tariffs, the *Guide* suggests. Contracting parties are settling down this autumn to give the Common Market external tariff a "thorough check-up." GATT's stringent rules will ensure that the external tariff of the EEC is on the whole not less advantageous than the four (Benelux, France, Germany, Italy) individual tariffs previously were to the contracting parties, so that the "Six" do not start off from an unduly advantageous position.

The *Guide* also surveys opportunities in Australia for British exporters of goods and capital. British firms already have over 500 branches and subsidiaries in Australia and the UK is estimated to have supplied £A520 million (63%) of £A819 million of private foreign capital invested in Australia in the last 12 years, compared with £A214 million (26%) contribution by the USA. Strong trade competition from the dollar area, Europe (West Germany in particular) and Japan has to be faced, however.

ELECTRICAL EXPORT TRENDS

Generating Sets, etc.: *improving*—Canada, Rhodesia and Nyasaland, Hong Kong, Nigeria, Pakistan, Union of South Africa, USA, Venezuela, W. Germany; *declining*—Belgium, Ceylon, France, Ghana, India, Iraq, Italy, Norway, Portugal, Spain, Sweden, USSR.

Transformers, Switchgear, etc.: *improving*—Argentina, Ceylon, Denmark, France, Ghana, Hong Kong, Italy, Kenya, Nigeria, Norway, Spain, Switzerland, Trinidad, USSR, USA; *declining* — Australia, Belgium, Rhodesia and Nyasaland, Finland, India, Iran, Iraq, Eire, Netherlands, Sweden, Venezuela, W. Germany.

Cables, Wires, etc.: *improving*—Argentina, Australia, Belgium, Canada, Finland, France, Ghana, Eire, Italy, Norway, Pakistan, Spain, Trinidad, USA, Venezuela; *declining*—Iraq, Netherlands, USSR.

Symposium on Automatic Control

A SYMPOSIUM on automatic control, sponsored by the British Conference on Automation and Computation and arranged by the Institution of Mechanical Engineers, is to be held in London on 27-28 Sept. next. British papers presented at the Moscow congress on automatic control from 27 June to 7 July this year will be discussed in eight sessions, dealing with:

Linear and Sampling Systems, Optimum and Multivariable Systems, Systems for Random Inputs and Disturbances, Self-Optimising Systems, Position and Speed Controls, Industrial Applications (Steelworks and Engineering), Industrial Applications (Processes), and Telecommunications and Information Processing.

Preprints of the 29 British papers are available and will be supplied to those registered to attend the symposium. Registration forms are available from the secretary, I.Mech.E., 1 Birdcage Wlk, S.W.1.

Jodrell Bank to be renamed

THE radio astronomy laboratories at Jodrell Bank are to be named "The Nuffield Radio Astronomy Laboratories," the Council of Manchester University announced last week. The outstanding £50,000 capital deficit of the Jodrell Bank radio telescope was paid off two months ago by Lord Nuffield and the Nuffield Foundation.

OFFICIAL PUBLICATIONS

UKAEA Report for 1959-60. HMSO. 5s (see page 101).

Report on the Census of Production for 1958. Part 130. Electricity.

BS 173. Rotating Electrical Machines for use on Road and Rail Vehicles. 10s.

Financial Assistance for the Development of Electricity on Farms in Gt. Britain and N. Ireland. EDA (see page 110).

ERA Publications:

A/T153, Effect of Heat Ageing on the Electrical and Mechanical Properties of Varnished Terylene Fabric, 12s 6d; A/T155, Grips for Tensile Tests on Very Extensible Tapes, A. G. Day, 4s 6d; D/T109, Pressure Piling in Compartmented Enclosures. I. Effects of Bore and Length of Connecting Tube in Explosions of Pentane/Air Mixtures, T. J. A. Brown, 12s 6d; J/T172, Creep and Rupture Properties of 2¼% Chromium, 1% Molybdenum Quality Steel. Summary of British Data (1% Creep Strain and Rupture), 7s 6d; L/T373, Oil-Impregnated Paper Capacitors. Some Factors Affecting the Discharge Inception Stress, J. H. Mason, 10s 6d; S/T106, Display-Storage Oscillography in Impulse Testing, E. L. White, 6s; Z/T122, High-Speed Cinematography of Sustained Power Arcs, J. C. Needham, 10s 6d.

Regional H.P. "Impracticable"

IT would be "quite impracticable" to have varying degrees of hire-purchase restriction according to the locality in which the h.p. transaction took place, the Parliamentary Secretary to the Board of Trade said in answer to a question in the Commons last week. Although it was realised that unemployment tended to be regional, hire-purchase restrictions must go with the goods and not with the area in which the sales take place.

The effect of the release of any one area would inevitably lead to transactions being carried out in the exempted area so as to escape the incidence of control, he added. This would inevitably weaken the present measures which are intended to stabilise the economy.

In a written answer to a Parliamentary question on the same topic, the Chancellor of the Exchequer explained that in deciding upon the recent measures to restrict credit he took into account the need to avoid any setback to the improvement in employment in N.E. England and other parts of the country where the level of unemployment had been relatively high.

It was much too early to say anything certain about the effects of the recent measures, but there was no evidence to show that they had had any bad effects on employment in N.E. England, where the level of unemployment had continued to fall in May and June. Mr Amory did not think that the restraining measures would have more than a marginal effect on industrial investment in fixed capital.

Pakistan Order

AN order for £57,000 worth of vertical hollow shaft and drip-proof electric motors to be shipped to the Batala Engineering Co. (Pakistan) Ltd. at Lahore has been received by Newman Industries Ltd. This is the first time that Batala have contracted to buy electric motors in quantity from a British firm. Further orders are likely to follow since it is estimated that the Pakistan company will require an additional £250,000 worth of motors over the next two years.

Newman Industries, who have just increased their factory floor area by 30,000 sq ft, are to spend an additional £100,000 this year on the further development of their Yate works.

Hobday Winding-up Petition

A PETITION for the winding up of Hobday Brothers Ltd., the wholesalers, is to be heard in the Royal Courts of Justice on Monday next. The petition is by the Commissioners of Customs and Excise, in respect of purchase tax, we understand. Hobday's are importers of "Ignis" and "Elektra" refrigerators. Outside concerns have expressed readiness to assist in the continuation of the business, we hear.

Power Station for Arsenal Site?

THE CEGB is considering a plan to build a power station on part of the Woolwich Arsenal site, the Secretary of State for War announced in a written answer to a Parliamentary question last week. This is one of the recommendations appearing in a report on the future of the site by the Hutchinson committee.

The power station would occupy the site of the old filling factory, and in addition a helicopter station might be built. Consultations regarding these proposals are proceeding and it is hoped to set the plan in motion "before very long."

Goldup Prize

THE Council of the IEE has agreed to the establishment of an annual prize, to be known as the Goldup Prize, for the best Higher National Certificate student who takes electronics or telecommunications subjects in his final examination. The prize has been endowed by Mullard Ltd. as a memorial to the life and work of the late T. E. Goldup, a past-president.

The existing Page Prize will in future be awarded to the corresponding HNC student who has taken electrical power subjects in the final examination.

A section of the new Simplex branch at Hull which was opened recently by Mr D. Bellamy, chairman of the Yorkshire Electricity Board, showing the Creda and Simplex Electric displays. Mr Bellamy ceremonially signed the first order to be passed through the depot. The new branch is described as a "bulk breaking" point, and will give improved service locally

FAIR TRADING IN THE WEST

THE activities of the Western Electrical and Radio Trades' Council to prevent unfair trading in the Bristol area had met with some success, Mr S. R. Wilson, chairman of the council, stated at the annual general meeting last week. Main function of the council, which has more than 100 members among all sections of the electrical industry, is to prevent the sale of electrical goods to the general public through unauthorised channels, and to investigate complaints concerning discounts and trading malpractices.

"Many people have been ill-advised to purchase complicated electrical equipment from a source other than an established retailer," Mr Wilson said. "They might save some money initially, but are penalised at a later date when service under guarantee or subsequent service is necessary."

Great interest had been shown in the work of the council by the electrical trade generally, he added. The council would offer assistance and advice to those wishing to set up a similar council in their own area.

The council was formed in March last year at the instigation of NECTA, but now operates quite independently.

ALL-GAS HOUSE?

AN "all-gas house" is the theme of a competition for architects announced by the Scottish Gas Board. Registered architects are invited to submit designs for a house which will exploit and demonstrate the possibilities of gas as a means of heating, cooking, water heating, refrigeration and home laundry (lighting is not listed).

The board is offering three prizes of £250, £150 and £75; and designs have to be entered by 26 Sept. next.

TV Decline

MANUFACTURERS' deliveries of television receivers in May fell by 49% compared with the same month last year, according to figures issued by the British Radio Equipment Manufacturers' Association. The May total of 90,000 was also well down on the April figure of 165,000, reflecting the influence of the h.p. curb.

Radio receivers, in contrast, continued to maintain their upward trend. In May, at 166,000, they showed an increase of 23% on May 1959 and 57% on May 1958. Radiograms, too, showed considerable gains. The May total of 13,000 was 86% up on that for May 1959.

E.T.U. Election Action

MR F. FOULKES, Mr F. Haxell and Mr R. McLennan gave an undertaking in the Chancery Division on Tuesday not to proceed with the election for the post of assistant general secretary of the Electrical Trades' Union other than by investigation of the election proceedings in No. 5 London Station Engineers branch at Stepney, and at Wolston branch, Southampton. They also undertook not to publish purported results of the election or purported votes for each candidate.

Mr Justice Russell adjourned until 27 July a motion by Mr C. F. Chapple, a candidate for the assistant secretaryship, for interim injunctions in an action in which he alleges electoral malpractices.

Equipment for B.R.

THE orders recently placed by British Railways for diesel-electric locomotives include 69 Type 2 units, which will be fitted with electrical equipment supplied by GEC. The power equipment will include the latest type of Sulzer six-cylinder diesel engine. Electrical equipment by GEC comprises the main and auxiliary generators, four traction motors and all associated control gear for each locomotive. Delivery will begin in 1961.

Board's "lack of foresight"

THE South Wales Electricity Board was accused of "lack of foresight" at a meeting of Radnorshire Rural Industries Committee at Llandrindod Wells last week, where criticism was expressed of the high cost of rural electrification and the board's "apathy regarding rural electricity."

A committee member quoted an instance of a place within 100 yd of an electricity supply costing £250 to connect to the mains. "There is obviously something wrong when a thing like that can happen," he said.

The Government were concerned over rural depopulation, but it would be far better if some of the hundreds of millions of pounds wasted in various directions were diverted to provide electricity in rural areas where the provision was not likely to be economic.

Royal Opening

THE Queen, accompanied by the Duke of Edinburgh, will open the South of Scotland Electricity Board's new power station at Kincardine-on-Forth, Fife, on 12 Oct. next. The first 100 MW set in the new power station was commissioned in December, 1958, and the first section, comprising three 100 MW sets, will be completed this year.

FISHY TALE

EXPERIMENTS in cooking frozen fish fingers by infra-red are being carried out by Smedley's Ltd., Wisbech. It is believed to be the first time an attempt has been made to use this method of heating for this purpose.

Welding Techniques in the U.S.S.R.

THE technological work of the various institutes in the USSR concerned with welding was excellent and the application of the theory to the development of welding techniques and processes was outstanding, the BEAMA welding delegation reported on their return from Russia a few days ago (referred to in last week's issue, p. 42).

In general, welding practice in the USSR had developed along similar lines to UK practice. Many semi-automatic processes had been manufactured to undertake duties covered by hand welding in the UK, but speed of welding was little faster. The development of hand welding in Britain was undoubtedly ahead, particularly in the field of high-current welding and in the use of iron-powder loaded electrodes.

Of great interest was the manner in which the technical institutes investigated problems from industry and developed a full solution of not only welding but all other aspects, typical examples being prefabricated oil storage tanks of 5,000 cu metre capacity, and inflatable steel pipelines up to 6 in. diameter. New techniques being developed included friction welding, semi-submerged arc welding of light alloys, electron beam welding, and hand surfacing by submerged arc welding.

But, the delegation reports, although there is much technological advance in welding, it would appear that some industrial plants are still using old processes due to shortage of production of new equipment.

Members of the BEAMA welding delegation on their return from the USSR where they studied Soviet progress and techniques in modern welding (see story above). Picture shows (left to right): G. M. Harvey (British Oxygen Gases), R. H. Boughton (English Electric), W. S. Simmie (Pressed Steel Co.), G. H. Moule (AEI Manchester), T. F. Tribe (British Federal Welder and Machine Co.), and R. L. Swan (Lincoln Electric Co.)

Holes in the Road

THE South of Scotland Electricity Board and the GPO are being indicted by Roxburgh County Council for failure to co-operate with them in a recent road construction scheme at Melrose. In a letter to the Secretary of State for Scotland, the council point out that when the scheme was completed the two bodies then announced that they intended to lay new cables. The GPO are to open 14 large holes in the new road surface and the electricity board plan to take up the pavements from one end of the street to the other.

The chairman of the road board said that both concerns were invited to state their plans before the road surface was completed. Neither bothered to reply and it was evident the people in charge had "no regard for co-ordinating their work and even less regard for public expense." He added: "I trust that someone in authority will attempt to knock some sense into them."

Sayings OF THE WEEK

"The full fruition of scientific work depends upon three things, the desire to know, the initiative to find out and the awareness to apply" . . . SIR CYRIL HINSHELWOOD in his tercentenary address to the Royal Society.

"I had come to ask him (President, BoT), in the interests of the export trade in telecommunications and telephone equipment, to destroy the ring, first, because it was wrong and, secondly, because it was disastrous to our export efforts." . . . MR. C. O. STANLEY, chairman, Pye Ltd.

"In my view a change of face is not a change of policy and the prospects for nuclear power are not diminished." . . . SIR ROGER MAKINS, chairman, UKAEA.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, July 19

	£ per ton	Weekly change £
COPPER, standard class A (settlement) ...	255½	−4½
" (3 months)	247½	−4¼
LEAD, refined pig, 99·97% purity (cash)	71½	−½
" (3 months)	71½	−¼
TIN, refined, min. 99·75% purity (settlement)	813½	+7½
(3 months)	811	+9
ALUMINIUM, ingots 99·99·5% ...	186	—
" wire bars (4×4×54")	193½	—
BRASS Strip 63/37	220½	−4½
SILVER (Troy oz)	79¼d	—

	£ per ton	Weekly change £
ZINC, virgin, min. 98% purity (cash)	90½	−¾
" (3 months)	89½	−¾
RUBBER, per lb. No. 1, R.S.S. spot	31⅜d	−⅛d
c.i.f. basis, ports, Sept.	31⅛d	—
ARMOURING: Galv. Steel Wire (0·104 in.) ...	66½	—
Mild Steel Tape (0·04 × 1¼ in.)	53*	—
NICKEL (home)	600	—
MERCURY (76 lb flask)	70½	—
AMERICAN PRICES: Copper, electrolytic (per lb) ...	33c	—
Lead (New York)	12c	—

* *Tape Price, now an average, includes varnishing*

Six women gaoled in "shocking" h.p. case

SIX housewives and a man were sent to prison for periods of up to 12 months at South Western Magistrates' Court, London, last week for selling goods obtained on hire-purchase involving the theft of washing machines, spin dryers, refrigerators, vacuum cleaners, tape recorders and other appliances to the value of nearly £16,000. It was "a terrible case that is an illustration of the shocking results that come from unbridled hire-purchase," the magistrate said.

The property all came from Vacuums Ltd., a company which was understood to be winding up, it was stated. Their representatives called at people's homes selling goods for cash or hire-purchase. The finance company involved was the Olds Discount Co., Nottingham.

Goods were ordered in the names of people who never wanted them and in other cases the names were fictitious. Cards were issued in each case and the matter came to light because after a time people whose names were on the cards were written to and replied "they knew nothing about it and did not want the goods."

The defendants would not reveal who had been buying the appliances concerned. "It is clear that there must be some substantial organisation," the magistrate commented.

Register of Standard Associates

IN our report of the formation of the above organisation last week (p. 68) we inadvertently referred to the scheme as the Register of Standards Engineers. The correct name, of course, is the Register of Standards Associates. The scheme is the result of a proposal made last May at the joint BSI/IPE Conference to form a standards engineers' association.

SALES GROWTH

IN the past 12 years the Midlands Electricity Board has increased its sales of appliances and contractual work from £1,400,000 a year to £9 million a year, Mr G. F. Peirson, the board's deputy chairman, said last week at the official opening of MEB's new service centre in Bearwood Rd, Smethwick.

News in Brief

Work is to begin immediately on construction of the Isle of Man Electricity Board's new diesel power station at Milntown, Ramsey.

The fourth cabinet-styling exhibition arranged by the British Radio Equipment Manufacturers' Association will be held at Victoria Halls, Bloomsbury Sq, W.C.1, 4-6 Oct.

Apprentices from nine well-known firms in north west London took part in an annual inter-company athletics meeting held this year at the AEI sports ground in Ruislip on 6 July. Associated Equipment Co. Ltd. won with 83 pts followed by AEI with 77 pts and Standard Telephones with 76 pts.

West Riding CC have been recommended by the Town and Country Planning committee to encourage the introduction of two further coal-fired power stations in the coalfield area of West Riding.

The national trophy for "good housekeeping" among power stations was last week presented to Meaford "A" by Sir Christopher Hinton, chairman of the CEGB. This is the first year of the contest which is based on inspections of power stations, taking into account the condition of plant, its age, layout, etc. Picture shows (left to right): Sir Christopher Hinton, Mr J. Barr (station superintendent), Lady Hinton and Mr T. Proctor (coal conveyor attendant who received the trophy on behalf of the station staff). Mr Proctor is the longest serving member of the Meaford Local Advisory Council, and also serves on both the Midlands District and the National Joint Advisory Councils

Company Activities

CONCERN over the country's "trade gap" arising from our June imports/exports brought the long three-week stock market account to an unsettled close. Recorded figures gave a gap of £99·1 million in June against £60·4 million in May although on a seasonally adjusted basis there was an improvement from £80 million in May to £71 million last month. The market, of course, sets great store on these figures. The existence or non-existence of credit squeezes at home and their impact upon business is a function of our external trading account and investors tend to move in anticipation of the events the trade figures appear to suggest for the future. Little, however, can be deduced from them at the moment. It appears that the fall in exports of 3% between the first and second quarters of 1960 (although they are still 8% above January-June, 1959) can be accounted for by a small reduction in exports to the sterling area and the failure of the US to import as much from us as might have been expected.

Seasonally adjusted imports show a rise from £371 million in the first quarter of the year to £378 million in the second quarter, but from £389 million in May they were down by £19 million in June to £370 million. This represents a fall between the two months of 4·4% while in the same period exports have fallen only 3·4%. Moves, therefore, in the right direction. Moreover, with the recently launched Government export drive and Mr Macmillan's address on the subject to industrialists and businessmen last Monday, coupled with the expectation that the credit squeeze will soon reflect its effect on stockpiling (and thereby mean a smaller call for imports) it is not unreasonable to assume that these "moves in the right direction" should before very long produce even more positive results for the economy. My own view is that the market, too, will adopt this reasoning and while it has the Wall Street question mark and holidays to contend with it will remain somewhat quiescent rather than nervous.

Meanwhile, there has been no lack of talking points in the electrical share market although most prices tended to ease slightly over the week. News that the AEI-John Thompson group and the Nuclear Power Plant Co. have been awarded the contract for the building of the 500 MW nuclear power station at Dungeness reacted unfavourably upon the shares. AEI dropped 4½d to 51s after being 51s 10½d at the beginning of the week while the 5s Ordinary shares of John Thompson toppled 1s 7½d to 16s 9d. And among those companies which go to make up the Nuclear Power Plant Co., C. A. Parsons shed 3d to 50s 9d and Head Wrightson 4½d to 21s 7½d but over the week were, rather surprisingly, 7½d better. Reyrolle, too, were 1s firmer on the news. So it looks as if feelings remain decidedly mixed even when it comes to building £60 million power stations!

Pye who, with its bid for Telephone Manufacturing, wants to break into the exclusive telephone makers' club was still very much in the limelight. Its shares finished the week 6d dearer at 17s 6d while Temco's 5s Ordinary shares went ahead to 17s 9d. But the opposing seven-strong consortium have since stepped up their bid to 15s cash.

On the decision by Murphy Radio to cut TV set output their 5s Ordinary shares were tuned down 1s to 15s 10½d, EMI went 9d easier but Philips Lamps were unchanged at 11 $\frac{13}{16}$d, Thorn Electrical went 9d lower and were 1s 9d cheaper over the week. Birmingham Sound Reproducers were marked down 2s 3d to 48s 9d, while Berry's Electric Magicoal, on the dividend jump from 13½% to a now 3·6 times covered 30% and the rise in before-tax profits from £237,000 to £405,700, dropped a non-magic 2s to 37s 6d. This has pushed up the dividend yield from 2·5% to 4%. It remains for chairman Mr Raymond Berry to tell us how the credit squeeze is likely to affect the company's sales.—*From our City Correspondent.*

Berry's Electric Magicoal Ltd.

With a sharp rise in profits, dividend is also raised for the year to 31 March. A final of 23½% makes the total distribution 30% on capital increased by a 50% scrip issue, compared with the equivalent of 13½% last time. Group profit increased from £237,879 to £405,731.

Drake and Gorham Ltd.

A record output was achieved in the year to 31 March last, but due largely to severe competition it was only the second best year for profit. Expansion of the contracting business is being hampered by a shortage of experienced electrical labour, especially in London, and this factor, combined with restrictions imposed by the Government, may make further progress in this country unrewarding, Mr R. H. M. Drake, the chairman, states. Particular attention is therefore being paid to business overseas. Another contracting business in Rhodesia has been purchased and arrangements made to purchase a company in South Africa which will manufacture some of the firm's products there. It is envisaged that this latter concern will eventually manufacture and/or assemble all the products which are in considerable demand in the Union.

Electronic Rentals and General Holdings

Provided no further restrictions are imposed, steady expansion should still be possible, Mr C. G. Mack, the chairman, tells shareholders. The market for "first time" TV is now close to saturation in most parts of the country, but the important relacement market will probably favour rental companies, he feels.

Engineering and Lighting Equipment Co.

There was a time when this concern was too largely dependent upon work from Admiralty and shipyards, but that is no longer so. Work that represented two-thirds of business in 1957 now amounts to only one-third of it, while remaining the same in terms of turnover, the Earl of Verulam, the chairman, states. A startling increase in sales of street-lighting equipment is primarily responsible for the change.

Hackbridge and Hewittic Electric Co.

With the net profit, after tax, etc., for the year to 31 March increasing from £183,958 to £199,824, the dividend is raised from the equivalent of 15% to 16%, with a final of 12%. The company propose to amalgamate with Switchgear and Cowans Ltd., as we note on page 108.

Lancashire Dynamo Holdings

For the year to 31 Dec. last, consolidated trading profit is £863,273 (*£836,466*), from which taxation takes £496,518 (*£439,670*).

Marryat and Scott Holdings

The increase in the total value of orders secured in the first three months of the current year is most gratifying, Mr M. D. Scott, the chairman, reports. The value of contracts in hand provides maximum works and installations employment for over a year ahead, he adds.

Metal Industries Ltd.

A 15% dividend is being paid for the year to 31 March last—an increase of 1%—as forecast. But the shares issued against the acquisition of Lancashire Dynamo Holdings and the one-for-one rights issue in May do not rank for the dividend. Consolidated trading profit for the companies in the group, other than those formerly in the Lancashire Dynamo group, increased to £1,722,715 (*£1,503,963*). After increased taxation charge, net profit is £887,561 (*£810,866*).

Newton Brothers (Derby) Ltd.

Trading profit for the 12 months ended 31 March last is £118,849 (*£136,730*), and after tax, etc., net profit is £63,638 (*£72,730*). Dividend is again 10% plus 6% bonus.

Parmiter, Hope and Sugden

A further reduction in profit occurred for the year ended 31 March last. After tax charge of £5,929 (*£14,134*) the net profit dropped to £8,570 from the previous year's figure of £17,443, which compared with £31,899 for 1957-58. Dividend is cut by 7½% this time to 12½%, with a final of 5%.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

22 July—Mildenhall R.D.C. Contract 2. Supply and erection of two each of 450, 600 and 125 g.p.m. crude screened sewage pumps and two 100 g.p.m. sludge and supernatant water pumps, all complete with motors, starters.—See 7 July issue.

22 July—Reading C.B. Supply and installation of cables, switchgear, fittings and accessories for distribution, control and site lighting for new Manor Farm Sewage Disposal Works, which is under construction. —See 9 June issue.

22 July—Twickenham B.C. Supply of: (a) reinforced concrete and (b) steel columns and brackets; (c) supply and erection of lanterns/control gear and erection of columns/brackets for 600 sodium and 3 x 20 fluorescent lighting units, being Stage IV of street lighting improvements.—See 7 July issue.

23 July—Edinburgh. Subcontract 1(e). Electrical installation in erection of ancillary buildings at West Hse Hospital, for Board of Management for the Royal Edinburgh Hospital for Mental and Nervous Disorders. Applications to architects: R. E. and B. L. C. Moira, 12 Inverleith Row, Edinburgh 3, by above date.

23 July—N.I. Hospitals Authority. (c) Electrical engineering services at new two-storey 65-bed ward unit at Musgrave Pk Hospital. —See 14 July issue.

25 July—E.B. for N. Ireland. Supply and erection of power, control and indication cables for boiler/turbo-generator No. 3 at Coolkeeragh Power Station.—See 7 July issue.

25 July—Epsom and Ewell B.C. Erection of 203 25 ft columns with fixing/wiring of 140 W sodium lanterns and gear.—See 14 July issue.

25 July—Londonderry. Supply of (Item 15) electrical materials for six months from 1 Oct., 1960.—See 7 July issue.

25 July—Manchester C.C. Electrical installations in 65 houses and flats at Maple Rd, Brocklands.—Advertised 14 July issue.

25 July—Manchester C.C. Electrical installation in Victoria Pk Secondary School. City Architect, P.O. Box 488, Town Hall.

25 July—Wanstead and Woodford B.C. Provision and erection of colour-corrected mercury street lighting in Snakes La East (Group "A"), Snakes La West (Group "B") and The Broadway (Group "B").—Advertised 7 July issue.

26 July—Birmingham C.C. Contract 675. Lighting and power installations in shops and maisonnettes (Stages 3 and 4) on Kents Moat estate. Documents available on deposit of £2 2s at office of Sir Herbert J. Manzoni, City Engineer and Surveyor, Civic Centre, Birmingham 1.

26 July—Brentwood U.D.C. Supply of one electrically operated movable box type paper baling press. Engineer and Surveyor, Council Offices, Ingrave Rd.

26 July—Ilford B.C. (a) Erection and connection of 1,000 columns; (b) cable laying, jointing and trenching; (c) thrust boring for Stage III of Group "B" street lighting. —Advertised 23 June issue.

27 July—Durham C.C. Renewal of electrical installations at Shield Row Modern School and electrical installation in new dental clinic at Spennymoor. Applications to County Architect, South St, Durham, by above date.

27 July—Moray C.C. Electrical work in erection of 20 houses at North St, New Elgin. Applications to County Architect, County Bldgs, Elgin, by above date.

27 July—Penybont R.D.C. Provision and erection of 72 100 W tungsten lamps on 15 ft columns on nine sites.—See 7 July issue.

27 July—Westmorland C.C. Supply of bedding, linen, crockery, cutlery and electrical appliances to Howard Home, 84 Milnthorpe Rd, Kendal, a home for 27 elderly people. Welfare Officer, County Hall, Kendal.

28 July—Cuckfield U.D.C. Erection of 23 octagonal steel lighting columns, fixing and wiring of 23 3/80 W fluorescent lanterns complete with control gear.—See 14 July issue.

28 July—Droitwich B.C. Supply and erection of 55 30 ft steel columns with 200 W sodium lamps/lanterns/gear and wiring plus the dismantling of 55 existing points.—Advertised 14 July issue.

28 July—Eston U.D.C. Supply and erection of 51 street lighting units along High St and Church La. Engineer and Surveyor, 246 Normanby Rd, South Bank, Middlesbrough. Deposit £2.

28 July—Omagh. Electrical installation in new Crown Bldg, Mountjoy Rd, for M. of Finance.—See 30 June issue.

29 July—Aberdeen Harbour Commissioners. Supply of, item 11, electrical fittings for year.—See 14 July issue.

29 July—Brighton C.B. Supply, erection and maintenance of three electrically driven submersible well pumps and four booster pumps with control gear, etc.—See 16 June issue.

30 July—Bridport B.C. Supply and erection of 26 Stewarts and Lloyds tubular steel fluted columns and 125 W m.v. lamps for Group "B" lighting at North Allington.—See 30 June issue.

30 July—Harlow U.D.C. Erection of 89 Group "B" columns, four Group "A" columns, fixing of 24 wall brackets, fitting/wiring of lanterns/control gear together with ancillary works.—See 14 July issue.

3 Aug.—Kingston upon Hull C.C Electrical installation in factory and office building consisting of 416 lighting points, 153 switches, 81 switch/sockets, sanitary incinerators, shaver supply unit and 41 three-phase outlets. Details available from Town Planning Officer, H. F. Alston, on deposit of £2 with City Treasurer.

5 Aug.—Romford B.C. Lighting included in private street works programme for (1) Parkland Ave and Lake Rise; and (2) Parkway. Borough Engineer and Surveyor, Town Hall.

6 Aug.—Bacup B.C. Supply and erection of street lighting along 1·5 mile Todmorden Rd and 0·9 mile Booth Rd. Town Clerk, A. D. Bond, Stubbylee Hall. Deposit £2 2s.

8 Aug.—Newbury B.C. Supply and erection of 30 140 W sodium lanterns to replace existing tungsten lanterns, moving of four steel columns and the erection of one new column. Borough Engineer, Municipal Offices.—Advertised in this issue.

8 Aug.—Wadebridge R.D.C. Supply and installation of 33 400 W colour-corrected mercury lamps for 25 ft mounting for A39 lighting and six similar lamps at The Platt. Surveyor, A. E. Bewes, Council Offices. Deposit £2 2s.

9 Aug.—Co. Londonderry. Electrical installation in new voluntary primary school at Swatragh. Architect: M. A. Fitzpatrick, Strand Chmbrs, 16-18 Strand Rd, Londonderry. Deposit £3 3s.

10 Aug.—Surbiton B.C. Installation of 193 sodium and 270 colour-corrected mercury Group "A" lighting points.—See 14 July issue.

10 Aug.—Wortley R.D.C. Installation, complete, of colour-corrected mercury lighting: scheme 54, Ecclesfield bus route, 67 125 W on 20 ft columns; scheme 55, Stannington bus route, 60 80 W on 15 ft columns; scheme 57, Chapeltown to High Green, 74 125 W on 20 ft columns; scheme 58 (part) Chapeltown 29 250 W on 25 ft columns.—See 14 July issue.

12 Aug.—Larne B.C. Electrical installations in: (a) shops and flats at Antiville; (b) 7/4 scheme of 50 dwellings; (c) 75 scheme for 52 dwellings.—See 7 July issue.

12 Aug.—Ulster Transport Authority. Supply of (Contract 65) batteries and battery plates; (Contract 77) accessories, adaptors, plugs and switches; (Contract 78) Empire cloth, p.v.c. and cotton sleeving for year from 1 Oct., 1960. Stores Superintendent, Duncrue St, Belfast 3. Fee: 1s each form.

15 Aug.—Birmingham C.C. Inspection and maintenance by passenger lift manufacturers of lifts on various flatted estates for 13 months from 1 Sept., 1960. Hsg Manager, J. P. Macey, Broad St, Birmingham, 1.

15 Aug.—Wick T.C. Electrical work in erection of 92 houses in Willowbank sixteenth development. Details from architects: Jenkins and Marr, 3 Bon-Accord Cres, Aberdeen.

16 Aug.—Islington B.C. Design, provision and installation of floodlighting at Market Rd playground.—Advertised 14 July issue.

18 Aug.—Cookstown. Electrical installation in hostel and extension at Loughry Agri-

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 105 queries answered this week

"Handymaid" irons—address for? E.E. Scottish Precision Eng. Co., 27 Cadogan St, Glasgow C.2.

"Ergon" medical lamps—makers of? W.W.—Ergon Electrical Mnfg. Co. Ltd., Vulcan Rd, Bilston, Staffs.

"Essell" insulating tapes—suppliers of? A.G.—Spicers Ltd., 19 New Bridge St, E.C.4.

"Towerbrite" hollow-ware—makers of? L.E.B.—The Midland Metal Spinning Co. Ltd., Tower Wks, Pelham St, Wolverhampton, Staffs.

"Systym" irons—address for? S.E.E.B. —Gatehill-Beco Ltd., Kennard Rd, Stratford, E.15.

"Prilect" incinerators—suppliers of? L.E.—Osborne Mnfg. Co. Ltd., 5-13 Highgate Sq, Birmingham 12.

"Silex" steam iron—repairers of? T.E. —J. L. Hoyle and Co., Diglis Rd, Worcester.

"Thermodare" night storage heaters—makers of? A.B.—Thermodare (Great Britain), York Mansion, 94-98 Petty France, S.W.1.

FURTHER ANSWER

"Copperweld" earthing rods—suppliers of? M.M.—Chilton Electric Products Ltd., Hungerford, Berks, are the sole distributors.

cultural for M. of Finance. Room 103, Law Courts Bldg, Belfast 1.

20 Aug.—North Shields. Rewiring of two wards at Preston Hospital. Superintendent Engineer, Preston Hospital, North Shields.

22 Aug.—Chelmsford. Subcontract 16. Provision and installation of cables, external lighting, heating and lighting of buildings, power distribution and control equipment for extension 2 at Brookend Sewage Disposal Works. Applications to E. P. Allen, Surveyor, Joint Sewerage Committee, Municipal Offices, Coval La, by 27 July.—Advertised in this issue.

24 Aug.—Bridge-Blean R.D.C. Supply of duplicate 75 g.p.m. against a 105 ft head vertical spindle direct coupled centrifugal sewage pumps for Tyler Hill scheme.—See 14 July issue.

31 Aug.—Renfrew T.C. Erection of alternative (a) 3 x 80 W fluorescent and (b) 400 W mercury schemes for A8 Inchinnan Rd street lighting improvements. Lighting Inspector: P. J. S. Buchanan, Municipal Bldgs.

1 Sept.—Dundee T.C. Supply and erection of multi-stage centrifugal pumps, accessories and switchgear for Menzieshill Pump Hse. Engineer and Manager, Water Dept., 1 Shore Terr.

1 Sept.—Warrington R.D.C. Installation of 48 Class "B" street lighting units on A574, Warrington Rd, Risley. Engineer and Surveyor, Council Offices, Museum St.

3 Sept.—Cambridge C.C. Supply of item (d) lamps.—See 14 July issue.

No date stated—Berks C.C. Supply and erection of 28 35 ft steel columns, lanterns and other work for Oxford Southern and Western By-pass scheme, Botley and Woodstock Rd roundabouts.—Advertised 30 June issue.

No date stated—Fishguard and Goodwick U.D.C. Provision, erection and wiring of 19 140 W sodium lanterns on 25 ft steel columns and 33 brackets on existing wooden poles for A40 street lighting.—See 23 June issue.

No date stated—Lanarks. Electrical work in (a) Wards 7 and 8 and (c) Nurses' Home, phase IV at Stonehouse Hospital. Gp Secretary and Treasurer, Board of Management Offices for Motherwell, Hamilton and District Hospitals, Strathclyde Hospital, Motherwell.

No date stated—Southampton C.B. Electrical and mechanical work in (a) electrical machines laboratory and (b) steam engines laboratory at College of Technology.—Advertised 14 July issue.

No date stated—S. Warwickshire Hospital Group.—Applications invited for inclusion in approved list of electrical contractors.—See 14 July issue.

No date stated—Taf Fecham Water Supply Board. Conversion to a.c. of treatment works at Pontsticill, near Merthyr Tydfil.—Advertised 16 June issue.

CONTRACTS PLACED

Barking B.C. Street lighting improvement on A13, A.E.I. Lamp and Lighting Co. Ltd., £5,917. Recommended.

British Railways (Scottish Region). Lighting installation in goods shed and yard buildings, Sighthill new goods depot, Glasgow, Sturrock Power Installations Ltd.; train indicator equipment, Queen St low level station, Glasgow, Standard Telephones and Cables Ltd.

Cardiff C.C. Supply of: 60 W and 140 W sodium lanterns and gear, General Electric Co., £9 and £11 each, respectively; time switches, Horstmann Gear Co., £3 each; Class A concrete, Class B and post-top columns, Stanton Ironworks, £19, £9 and £9, respectively. Recommended.

Edmonton B.C. Passenger lift at Block B, Snells Pk, Hammond and Champness Ltd., £2,804; electrical installation in Alpha Rd scheme, direct labour, £6,349. Recommended.

Lambeth B.C. Installation two lifts at Town Hall, Otis Elevator Co. Ltd., £7,555. Recommended.

Maidenhead B.C. Electrical installation in new municipal buildings, W. H. Gaze and Sons Ltd., £10,590. Recommended.

Manchester C.C. Electrical installations: in 11 bungalows on Catterick estate, F. L. Bampton Ltd.; in Moseley Rd Secondary School, Wainwright's (Electrical) Ltd.; in Royle Green County Infants' School, Northenden, F. Mather and Co. Recommended.

Norwich C.C. Renewal of wiring and lighting installations in St. Andrew's Hall, Johnson, Pearce and Co. Ltd., £3,234. Recommended.

Nottingham T.C. Provision of improved lighting in abattoir, East Midlands Electricity Board, £1,075. Recommended.

Sheffield C.C. Electrical installation modernisation in Town Hall, Yorkshire Electricity Board, £9,470. Recommended.

Sunderland T.C. Electrical installation at Southmoor Technical School Hse, North of England Eng. and Electrical Co. Ltd., £500 4s 6d.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

28 July—Costa Rica. Transformers, lightning arresters, steel structures complete with insulators, busbars and accessories for Rio Macho No. 1 Substation. La Proveeduria, Instituto Costarricense de Electricidad, San Jose. B.o.T. (ESB/18081/60).*

29 July—America. 115 kV control, relay and metering panels for Lake Chelan Switchyard. Public Utility District No. 1 of Chelan County, 327 North Wenatchee Ave, Wenatchee, Washington. B.oT. (ESB/18014/60).*

29 July—Pakistan. 131,300 ft single conductor rubber insulated Neoprene covered wire in various sizes and 1,250 1 kV two-conductor cable. Utah-Pakistan Inc., 221 Pine St, San Francisco 4, U.S.A. B.o.T. (ESB/17398/60/ICA).*

30 July—Ecuador. Supply and installation of h.t. line to Parish of Naranjito. Secretariat, Cantonal Council of Milagro, Provincia de Guayas. B.o.T. (ESB/18037/60).*

30 July—Formosa. 5,000 3·45 kV crossarm mounting plug type primary fuse cutouts. Central Trust of China, Purchasing Dept., 68 Yen Ping Nan Lu, Taipei, Formosa. B.o.T. (ESB/18045/60).*

1 Aug.—Costa Rica. 360 metres 6·6 kV 2-conductor cable and 1,080 metres of 10-conductor cable. La Proveeduria, Ferrocarril Electrico al Pacifico, San Jose. B.o.T. (ESB/18434 and 5/60).*

1 Aug.—Formosa. 6,700 7·5 kV fuse cutouts and fuse links. Central Trust of China, Purchasing Dept., 68 Yen Ping Nan Lu, Taipei, Formosa. B.o.T. (ESB/18076/60).*

2 Aug.—India. 200 yd 3-core 0·1 sq in. 11 kV cable and 400 yd 1·1 kV t.r.s. trailing cable. Chief Engineer, Madras Port Trust, Madras. B.o.T. (ESB/18160/60).*

2 Aug.—Liberia. Telecommunication system including 3, 5 and 10 kW transmitters. Harry Grimes, Commissioner of Communication, Liberian Embassy, 5201, 16th St N.W., Washington D.C., U.S.A. B.o.T. (ESB/18118/60/DLF).*

3 Aug.—Canada. Fault locating instrument for use on a 600 V system. Mr J. R. Woods, Purchasing Dept., Toronto H.E. System, 14 Carlton St, Toronto 2. B.o.T. (ESB/18223/60).*

3 Aug.—Costa Rica. 66 transformers, 108 drop-out fuse cutouts 5 kV 50 A, 10,000 lb copper wire. La Proveeduria, Instituto Costarricense de Electricidad, San Jose. B.o.T. (ESB/18420/60).*

4 Aug.—America. One 27-36 kVA, 6·6/115 kV transformer. District Engineer, U.S. Army Enrg. District, 628 Pittock Block, Portland 5, Orgeon. B.o.T. (ESB/18012/60).*

4 Aug.—Costa Rica. 3,675 meters and 60 transformers. La Proveeduria, Instituto Costarricense de Electricidad, San Jose. B.o.T. (ESB/18421/60).*

11 Aug.—S. Africa. (1) 5,000 aerial cable supporting clamps; (2) 5,000 suspension hooks; and (3) 1,000 isolating links. Secretary, Union Tender Board, 291 Bosman St, P.O. Box 371, Pretoria. B.o.T. (ESB/18143/60).*

17 Aug.—S. Vietnam. Telephone line equipment including 25,000 ft cable, 1,982,000 ft wire, splicing and dead-end sleeves, clamps and cable supports, and insulating materials. Central Purchasing Authority, P.O. Box H5, Saigon. B.o.T. (ESB/18108/60/ICA).*

18 Aug.—India. 550 miles a.c.s.r. conductors. Purchase Officer, Mysore State Electricity Board, P.B. 15, Bangalore. B.o.T. (ESB/18060/60).*

22 Aug—India. Two control panels for 700 kVA Skoda diesel generating sets. Specification U(B)414, fee Rs 5, by cash or crossed P.O. from Additional Chief Engineer (Electrical), Assam State Electricity Board, Lachumiere, Shillong.

23 Aug.—India. Fifteen items of 11 kV and l.t. cable and cable boxes. Superintending Engineer, Technical (Electrical), Madras State Electricity Board, 157 Mount Rd, Madras 2. B.o.T. (ESB/18055/60).*

24 Aug.—India. Three testers for bushings, insulators and lightning arresters. Purchase Officer, Mysore State Electricity Board, P.B. 15, Bangalore. B.o.T. (ESB/18059/60).*

TRADE NOTES

Change of Address. The Birmingham office of Allen West and Co. Ltd. has moved to Pearl Assurance Hse, Temple Row, Birmingham 2. The telephone number remains Central 7831.

New branch. Fag Bearing Co. Ltd. have opened a new branch at 36 Mansel St, Swansea. Telephone: Swansea 53304.

BEAMA Contract Price Adjustment Formulae. *For Electrical Machinery and Equipment.* For purposes of calculating variations in (*a*) "Rates of Pay"—the rate of pay for adult male labour at 15 July, 1960, shall be deemed to be 204s 6d; (*b*) "Cost of Material"—the index figure for materials used in the Electrical Machinery Industry at 15 July, 1960, is 117·1* (181·7*).

For Turbo-Generating and Allied Plant. For purposes of calculating variations in: (*a*) "Rates of Pay"—the rate of pay for adult male labour at 15 July, 1960, shall be deemed to be 204s 6d: (*b*) "Cost of Material"—the index figure for Materials used in the Mechanical Engineering Industry at 15 July, 1960, is 126·8* (190·5*), "Blast Furnaces and Iron and Steel Melting and Rolling (1948 S.I.C. ref. 40/41)," 188·6*. Other Steel Goods, excluding tubes (1958 S.I.C. ref. 311/2), 128·5*. The price of brass condenser tubes ¼ in. o/d 18 s.w.g. on 15 July, 1960, is 4s 2d per lb. *Provisional figure.

The figures in parentheses shown above relate to the earliest list of wholesale price index numbers in which the year 1949 is taken as the base 100. For the other figures 1954 = 100.

S.A. Dumping Duty. The South African Government have imposed, as from 1 July, ordinary dumping duty in addition to any other duties payable thereon, on household refrigerators from Italy, or cabinets without fittings or completely fitted out, for household refrigerators imported from that country.

BUSINESS PROSPECTS

Ashton-in-Makerfield. Lowton Construction Co., Lowton, Leigh, Lancs, contractors for Lowton Metals factory.

Bardas Atha Cliath T.C. Tender: Four five-storey blocks of flats, Rathmines Ave area. Architect, 6 Mountjoy Sq, Dublin.

Barrow-in-Furness. Vickers-Armstrong (Engineers) plan Bridge Approach training centre.

Beverley B.C. Tender: 62 houses on St. Giles Croft and Swinemoor estate. Clerk.

Birkenhead. KWK (Birkenhead) plan Price St engineering factory.—British Transport Commission plan Lom St club building.

Birmingham. Sir Hugh Casson and Neville Conder, 35 Thurloe Pl, S.W.7, architects for £1,638,250 seven halls of residence, at University.—T.C. Tender: Eight two-storey dwellings, Glebe Farm Rd. Architect.

Blackwell R.D.C. Tender: 24 Thickley Bank houses. Engineer.

Bradford. F. H. Bentham, West End Wks, Richmond Rd, Bradford 7, plan Legrams La engineering factory.

Bromley B.C. Tender: 27 Crown La flats. Borough Engineer.

Cardiff. Mercer and Miller, 2 Upper Northgate St, Leicester, quantity surveyors for £100,000 Royal Insurance Co.'s Windsor Terr offices.

Carlisle. P. H. K. Knighton, Benfield Rd, Newcastle, architect for extensions to Cumberland Infirmary wards.

Carmarthen. Tender: Office block in town centre. Architect, Davies Agricultural Services Ltd., Burton Chmbrs, King St.

Caterham. Truett and Steel, Thornton Heath, Surrey, contractors for £30,000 conversion of mansion into hospital for Marie Curie Foundation.

Chelmsford. Derek Walden, 136 New London Rd, architect for Horner and Wells Widford Industrial Estate factory and offices—Walden also architect for five workshops, etc., Brockley Rd, for Turp and Blackburn.—R. C. Harrison, White Roding, Dunmow, Essex, architect for Windley Bros. Ltd., Beech's Dr, factory and offices.

Chesterfield T.C. Street lighting planned Peveril Rd Estate and estate near High St, Old Whitington.

Croydon. Trojan Ltd. plan alterations, Trojan Way.—Harold Williams and Ptnrs, 80 High St, architects for Canterbury Rd factory.—Andrews, Emmerson and Sherlock, 63 Dean St, W.1, architects for Eros Cinema site shops for Cranleigh Group, 109 Princess St, Manchester.—Advance Freehold Investments plan Dingwall Rd and Lansdowne Rd office block.—Burleigh Gardens Investments plan Lansdowne Rd and Walpole Rd office block.—B.C. Tender: 242 dwellings in two-, three- and four-storey blocks. Engineer.

Dagenham. Coborn Engineering Co., 35 New North Rd, Ilford, plan Abbey Kapok factory.

Darlington B.C. Skerne Park School planned. Architect.

Dartford. Illinois Stoker and Combustion Co. plan Prices Rd extensions.—Wellcome Foundation plan staff building, Wellcome Chemical Wks, Temple Hill.

Easington. J. Nimme and Son, Castle Eden, plan extension of mineral water factory block and offices. Own architects.

Eastbourne. Martin and Martin, 5 Hyde Gdns, quantity surveyors for Edwards High Vacuum Brampton Rd estate factory.—A. H. Hunt (Capacitors), Bendon Valley, S.W.18, plan Brampton Rd estate factory.—Planned: Simplantox, 67a Willowfield Rd boiler house.—Birds Eye Foods Ltd., Lottbridge Dr, cold store and substation.—T. Wall and Son, Acton, W.3, trading estate premises.

East Suffolk C.C. Tender: Four-storey office block, Lowestoft. Architect.

Eccles B.C. Tender: 90 flats on four sites. Architect, F. Bradley, 4 Wood St, Bolton.

Ennerdale R.D.C. Tender: 285 houses, 10 bungalows and 177 garages, Orgill, Egremont, Cumberland. Engineer.

Felling U.D.C. 105 Wellington St flats planned; contractors: J. Clark and Son.

Gravesend B.C. Tender: 42 Singlewell estate houses. Engineer.

Guildford. W. Earle-Yeates, 154a Church Rd, Hove, Sussex, architect for Transformers and Rectifiers Ltd. factory, Woodbridge Meadows industrial estate.

Halifax. O and C Estates, 9 Harrison Rd, plan £500,000 development scheme: hotel, department store and covered car park.

Hendon B.C. Tender: Five-storey building and elevated roads, North Circular Rd. Engineer.

Horsham. Codman and Kay, 13 North Parade, architects for £150,000 Watt Settlement Trust flats, The Bishopric.

Humbledon, Sund, T.C. J. Prentice, Leeds St, Sunderland, contractor for £67,000 training centre.

Inverness C.C. Tender: New county buildings. Clerk.

Ipswich. Patron Investments plan shops and offices, 27,419 sq ft, on Public Hall site and 23 Westgate.

Isleworth. £34,690 Acton Lodge training centre for Middlesex Health Committee.

London. S.W. Metropolitan Hospital Board, 40 Eastbourne Terr, W.2, plan £85,000 stage 1 of Lambeth Hospital, S.E.11.—Board also plan £28,850 accommodation for nurses at Wanstead Hospital and central heating extension at Bethnal Green Hospital, £33,679.—Extensions planned for King Edward Memorial Hospital, Churchfield Rd, W.13.—St. Olave's and St. Saviour's Grammar School to move to Orpington. Governor's office clerk, Tooley St, S.E.1.—Hostel and teaching block planned for College of St. Mark and St. John, King's Rd, S.W.3.—Governors of Cardinal Vaughan School plan school at Addison Rd and Holland Villas Rd, W., cost £155,319.—City of London Corpn. to lease 165 Fenchurch St to City of London Real Property Co., 16 Mark La, E.C.3, for £50,000 improvements.—George Trollop and Sons, 13 Hobart Pl, plan five-storey office block, 4 Greek St, W.1.—J. E. Ralph, 1 Gower St, W.C.1, plan Portman Sq premises: offices, flats and light industrial.—A. Green, 23 Fitzroy St, W.1, architect for shops, flats, at Fitzroy St for Rowton Houses Ltd.—£150,000 scheme by L.C.C. architects' div., for Fenelon Pl, W., hostel for women.—Yorke, Rosenberg and Mardall, 2 Hyde Park Pl, W.2, architect for Greystoke Pl school, Fetter La site offices.—Norman Green, 12 Adeline Pl, W.C.1, architect for Park La/Brick St office block.—R. Seifert and Ptnrs, 28 Gt. Ormond St, W.C.1, architects for D. E. and J. Levey's shops, showrooms, etc., in five-storey building, Southwark.—Sir Lancelot Keay, Basil G. Duckett and Ptnrs, 2 Oldbury Pl, W.1, architects for Lowndes St/West Halking St flats.

Manchester. P. Hamer, Park St, Swinton, contractors for Rolinx Ltd. factory, Ledson Rd, Wythenshawe.—Planned: Dantzig St Rubber Wks extensions, Irk Rubber Wks extensions, Queen's Rd, Collyhurst; Red Tower Lager Brewery extensions, Denmark Rd, Moss Side; Ledson St factory and offices.—£421,643 extension to College of Housecraft for accommodation of 170 students; furniture and equipment, £89,000.—£118,124 stage 2 of teacher training hostel, Didsbury Training College, planned by Education Committee; £14,000 furniture and equipment.—Committee plans £67,801 day school for deaf with £12,000 furniture and equipment.—F. J. Gibson (Builder), Riverside Wks, Manchester Rd, Wilmslow, contractors for Harpurhey Technical High School for T.C.—Moston Brick and Building Co., Kenyon La, contractors for Whitebrook Day School for Deaf, Fallowfield.—B.B.C. plan Oxford Rd Regional H.Q.

Middlesex C.C. £66,500 Heath Lodge, Hanwell, remand home planned.

Morpeth. Newcastle Hospital Board plan £3,000 plus scheme for ward at Stannington Children's Hospital. Architect to Board.

Newcastle. Percy L. Browne, Son and Harding, Pearl Bldgs, Northumberland St, architects for Eslington Terr banking hall alterations for National Provincial Bank.

New Sarum T.C. Tender: Six houses, 58 flats and garages, Essex Sq, West Harnham, Salisbury. Engineer.

Northallerton. R. W. Gregory and Ptnrs, Pilgrim Hse, Pilgrim St, Newcastle, consulting engineers for nurses accommodation, Friarage Hospital.

N. Riding. W. W. Atkinson, 4 Raymond Bldgs, Gray's Inn, W.C.1, architect for Malton Junior School.

Norwich. £150,750 Little Plumstead Hospital planned by E.A. Hospital Board, Cambridge.—Board also plans medical unit, Northgate Hospital, Gt. Yarmouth, £60,785.

Nottingham. John Gale and Co., 219 Arkwright St, Plan Gregory St factory.

Oxford. St. John's College authorities plan demolition and office development of Oxenford Hall site, 13 Magdalen St. College Estates Department.

Peterborough. Joint Education Bd plan £685 electrical modernisation, King's School. Board's Architect, Bridge St.

Poole. Stewart Kilgour, Wessex Regional Hospital Board, Romsey Rd, Winchester, architect for £60,000 General Hospital.

Reading. Planned on Whitley Kiln Industrial Estate: G. T. Galloway (London), 1 Brixton Rd, S.W.9, Factory No. 20; Mycroshims, 6 Old Bailey, E.C.4, Factory No. 25; Vincent Construction Co., 89 Regency St, S.W.1, Factory No. 15.

St. Albans. Hertfordshire Spastics Society plan City Hospital treatment unit.

Scunthorpe. Bartle and Son, Central Printing Wks, plan Station Rd printing works.

Shaftesbury. Lowe Aston, 293 Ley St, Ilford, Essex, plan factory.

Sheffield. John Bedford and Sons, Lion Wks, to lease 2,384 sq yd Moybray St land.—John Holmes and Sons, Bradway, contractors for Willesden Optical Works Ltd. Matilda St workshops and offices.

Southend-on-Sea. G. J. Keddie and Son, High St, plan Warrior Sq departmental store and 14-storey office block.

Spennymoor. N.E. Housing Association, Windsor Terr, Newcastle, plan 120 Barnfield Rd houses for U.D.C.

Stafford. Sir Alfred McAlpine and Sons, 49 Waterloo Rd, Wolverhampton, contractors for B.R.C. Steel Silkmore La building.

Stockport. £200,000 research centre planned by Hawker Siddeley Industries, 32 Duke St, S.W.1.

Surbiton. Solartron, Queen's Rd, Thames Ditton, plan Cox La factory.—Associated British Foods plan Cox La cold store and depot for Neilsons Ltd., Camden St, N.W.1.—Presland and Ptnrs, 21a Victoria Rd, plan Tolworth Brickworks, Red Lion Rd factory.

Totnes R.D.C. Tender: Block of six flats, Higher St, Dittisham. Engineer.

Tynemouth T.C. Billy Mill branch library planned. Engineer: D. M. O'Herlihy, 16 Northumberland Sq, N. Shields.

Wallsend-on-Tyne. Victor Products Ltd., Church Bank, plan Limekiln Rd factory.

Watford. British Transport Commission, Marylebone Rd, N.W.1, plan Balmoral Rd main offices for freight terminal.

West Bromwich. Ventris and Maple, Hersham Factory Estate Co., Lyon Rd, Hersham, Surrey, plan two-storey office block on estate.—Wm. King, Park St, Bull Ring, Birmingham, plan Union Rd buildings.—Bromford Iron and Steel Co., Bromford La, plan Bromford La foundry buildings.—Holland W. Hobbiss and Ptnrs, 36 Waterloo St, Birmingham 2, architects for Alfred Adams and Co.'s extensions, Church La.—Bracewell, Harrison and

Business Prospects continued

Coton, 25 Augustus Rd, Edgbaston, Birmingham 15, architects for Sandwell Casting Co.'s Bank St die-casting shops extensions. —W. G. Folkes and Sons, Gt. Bridge, Tipton, plan Salem St engineering workshop extensions.—C. C. Gray, 16 Bridge St, Walsall, architects for John Cashmore Ltd. extensions to sheet steel dept., Bagnall St.—P. G. Marks, 19 Highfield Rd, Birmingham 13, architect for B. A. Taylor (Metals) offices and laboratory, Gt. Bridge St.—Clifford Tee and Gale, Frederick Rd, Edgbaston, Birmingham 15, architects for Joseph Lucas warehouse/offices, B'ham Rd.

West Hartlepool. G. M. Pearson and Son, Front St, Hetton, contractors for 88 houses. —N.E. Housing Association, Windsor Terr, Newcastle, plan 60 Rift estate houses.—T.C. Tender: Family Group Home, Owton Manor estate. Architect.

West Riding C.C. Tender: 10 pairs constable type houses and two senior officer type houses, Walton La, Sandal. Co-Architect, "Bishopgarth," Westfield Rd, Wakefield.

Weymouth and Melcombe Regis B.C. Tender: 26 bungalows on various sites. Engineer.

Whickham. A. Watson, Front St, plans nine shops in Front St.

Winchester. Wessex Hospital Board plan office block, chief architect, Stewart Kilgour, Highcroft, Romsey Rd.—J. Hopwood, 53 Shorts Gdns, Drury La, W.C.2, architect for new Trust Houses hotel.

Wrexham B.C. Tender: 14 Sutton Dr dwellings, two Archers Way dwellings and garages. Engineer.

York. William Stevens plan Hull Rd printing works extensions.

Gazette Announcements

COMPANIES ACTS

Kitbans Trdg. Co. Ltd. and **Recto Trdg. Co. Ltd.** Mr K. R. Cork, 19 Eastcheap, E.C.3, appointed liquidator as from 22 June.

Hobday Bros. Ltd. Petition for winding up to be heard before the High Court of Justice, Strand, W.C.2, on 25 July. Persons intending to appear to notify M. G. Whittome, King's Beam Hse, Mark La, E.C.3, by 1 p.m. 23 July.

Thermal Units Ltd. Mr J. H. Wilson, Bucklersbury Hse, Bucklersbury, E.C.4, appointed liquidator at extraordinary general meeting on 11 July for the purpose of voluntarily winding-up.

Wheeler and Pearce Ltd. Dividend per £: 3s 6d, payable at Poppleton and Appleby, 93 Queen St, Sheffield 1, on 29 July.

Amersham Power Tool and Accessories Hire Service Ltd. Mr H. M. Arthur, 6 Cavendish Court, 11-15 Wigmore St, W.1, appointed liquidator as from 10 May.

BANKRUPTCY ACTS

Receiving Orders

Bradford. E. Smith, electrical contractor, carrying on business at 28 Heaton Rd, Bradford 8. Receiving order dated 7 July.

Middlesbrough. D. W. Delve, radio, television and electrical dealer, carrying on business at 182 High St, Eston, and at 107 Parliament Rd, Middlesbrough. Receiving order dated 7 July.

Southend. G. D. Chaplin, electronics engineer, of 18 Manor Rd, Woodford Bridge. Receiving order dated 30 June.

Manchester. T. J. Evans, electrical contractor, formerly carrying on business as Gatley Electrical Services at 82 Chester Rd, Hulme, and previously in partnership as T. J. and R. Evans. Receiving order dated 12 July.

Application for Discharge

Tunbridge Wells. J. H. Pickwell, carrying on business as a retailer of electrical goods and handicraft materials as J. H. Pickwell and Co., at 79 London Rd, East Grinstead, and as an electrical engineer and contractor at 108 London Rd, East Grinstead. Application for discharge to be heard at 10.30 a.m., on 4 Aug., at Court Hse, Crescent Rd, Tunbridge Wells.

Appointment of Trustees

Salford. H. Vickers, electrical goods retailer, formerly carrying on business as Victric Co., at 425 Bury New Rd, Higher Broughton. Mr J. A. Freeman, 8 Manchester Rd, Bury, Lancs, appointed trustee as from 4 July.

Southampton. D. G. Mayell, electrical contractor and domestic appliance dealer, carrying on business as Electroservice at 82 Park Rd, Freemantle. Mr R. G. B. Booth, 21 The Ave, Southampton, appointed trustee as from 11 July.

Coventry. D. A. Jolley and J. F. Laight, retailers, formerly carrying on business as Supreme Electrical Products, at 105 Far Gosford St, Coventry. Mr K. D. Wickenden, Stoneleigh Chmbrs, 2 Queen's Rd, Coventry, appointed trustee as from 7 July.

Release of Trustees

Torquay. G. Frankis and B. W. V. Smith, electricians, radio and gramophone dealers, formerly carrying on business in co-partnership as Brixham Electric Service, 4 The Strand, and 9 Fox's Court, Brixham. Trustee: A. D. Gwyther, Royal Bldg, St. Andrew's Cross, Plymouth, released as from 4 July.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Aerovap. 802,025. Class 11. Apparatus for air conditioning, etc. Aerovap Holdings Ltd., Shernfold Pk, Frant, Tunbridge Wells, Kent.

Diplomat. 802,578. Class 11. Lamps. Ascot Lamps and Lighting Ltd., Arcola St, E.8.

Elliotest. 798,033. Class 9. Apparatus, etc. Elliott Brothers (London) Ltd., Century Wks, Lewisham, S.E.13.

Hymeg. B792,426. Class 17. Insulating compounds, etc. Lewis Berger (Great Britain) Ltd., Berger Hse, Berkeley Sq, W.1.

Lidomatic. 790,125. Class 11. Water heaters, etc. Heatrae Ltd., St. George's St, Norwich, Norfolk.

Kingsgrove. B797,078. Class 11. Refrigerators, etc. Kingsgrove Ltd., 101 Ladbroke Grove, W.11.

Numalec. 797,179. Class 9. Apparatus, etc. Cambridge Instrument Co. Ltd., 13 Grosvenor Pl, S.W.1.

Redring. 778,084. Class 11. Heating elements for domestic and industrial purposes. Metropolitan-Vickers Electrical Co. Ltd., 33 Grosvenor Pl, S.W.1.

Scharpf Gyrawash, Scharpf Rotadry II and IV, Scharpf Rotarinse, Scharpf Rotawash. B793,917 to 21. Class 7. Washing machines, drying machines, etc. Gebruder Scharpf Komm-Ges Maschinenfabrik, 17-19 Gottfried-Keller-Strasse, Stuttgart-Zuffenhausen, Germany.

Shira. 804,055. Class 9. Radio receivers, etc. Winter Trdg. Co Ltd., Winter Hse, Ladbroke Grove, W.11.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

Ace Neon Signs Ltd., Grainger Rd Industrial Estate, Southend-on-Sea. Nom. cap.: £1,000. Dirs.: Francis T. Kemp and Barry R. Gough.

Alcan Enfield Alloys Ltd. To acquire from Enfield Rolling Mills Ltd. the fee simple of certain works situate at Bradford, Yorks, and to acquire the business of production of aluminium alloys from scrap at present carried on at such works and elsewhere by Enfield Rolling Mills (Aluminium) Ltd. Nom. cap.: £100. Dirs: not named Subs.: Percy J. Davis, 12 Norfolk St, Strand, W.C.2; and William W. Kee, 11 Midway, Watford Rd, St. Albans.

Banquel Ltd., 6 Surrey St, W.C.2. Manufacturers of and dealers in vacuum cleaners and components, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Stanley H. Lucas and Francis A. Dean.

Bantlon Ltd., 6 Surrey St, W.C.2. Manufacturers of and dealers in vacuum cleaners, etc. Nom. cap.: £100. Dirs.: to be appointed by subs.: Subs.: Stanley H. Lucas and Francis A. Dean.

Bingomatic Ltd., Bingomatic Hse, Warrington Rd, Platt Bridge, nr. Wigan. Electricians, etc. Nom. cap.: £1,000. Dirs.: James Case and Basil Toubkin.

D.E.A. Ltd., 3 Grosvenor Rd, Ilford, Essex, Manufacturers of electrical equipment, etc. Nom. cap.: £100. Dirs.: John F. Saunders, Ernest V. Kingston and Mrs Irene M. Saunders.

Industrial Electronic Heater Services Ltd., 42 Bedford Ave, W.C.1. Designers, manufacturers of and dealers in industrial or domestic heating, testing and control equipment, etc. Nom. cap.: £100. Dirs.: Sydney McGregor, Christopher E. M. Tibbs, Edmund C. Stanley and Jas. F. Cullingham.

Mills and Rockleys (Electronics) Ltd. Signwriters, signmakers, etc. Nom. cap.: £5,000. Dirs.: not named. Subs.: George T. Mills, 48 Queens Rd, Coventry; and Hugh G. Ellinger.

Norfolk Instruments Ltd., Industrial Estate, London Rd, Thetford. Electronic and automation engineers, etc. Nom. cap.: £1,000. Dirs.: Stanley C. Hoare and Ashley C. Hoare.

Oslo Electronics (Wholesale) Ltd., 77 Portland Pl, W.1. Nom. cap.: £100. Dirs.: Albert L. Crowe and Philip Smethurst-Evans.

Phillip-Smith Organisation Ltd., 126 Wigmore St, W.1. Manufacturers of and dealers in electrical goods, etc. Nom. cap.: £100. Dirs.: Clifford P. Phillips and Brian C. Smith.

C. Pryke (Electrical) Ltd., 9 Station Rd, Stowmarket, Suffolk. Dealers in electrical goods, etc. Nom. cap.: £5,000. Dirs.: Claude Pryke, Cyril E. Matthews, Mrs Lily E. Pryke and Mrs Greta M. Matthews.

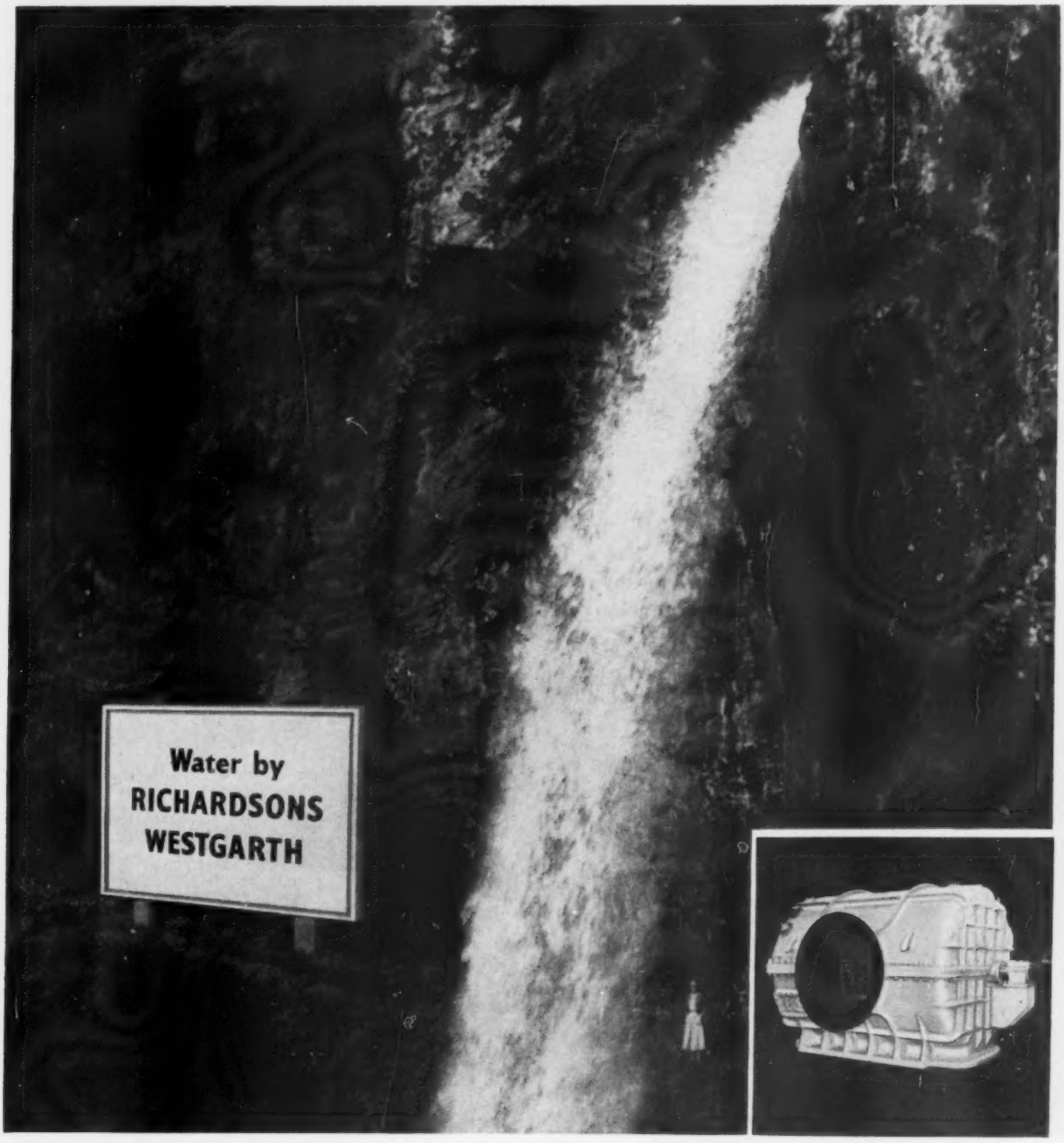
Specialist Switches Ltd., 97 and 99 Park St, W.1. To acquire the goodwill, equipment and stock-in-trade of the business of manufacturers of electrical components carried on as "Specialist Switches" by Knight-Clarke Ltd., etc. Nom. cap.: £100. Dirs.: Charles E. K. Clarke, Patricia A. K. Clarke and Richard G. Hackwell.

Willis Engineering Ltd., 2-3 Charterhouse Sq, E.C.1. General, electrical and mechanical engineers, etc. Nom. cap.: £100. Dirs.: Harry P. Willis and Mrs Joan L. W. Willis.

MEETING TO NOTE

THURSDAY, 21 JULY

I.E.E. (Electronics and Communications Section). Third International Conference on Medical Electronics at Olympia until 27 July.



A single strainer of the type we supply to the C.E.G.B. handles five million gallons of water an hour . . . enough to maintain quite a spectacular waterfall. At Aberthaw Power Station there are six such units with a total capacity of 30,000,000 g.p.h. straining the condenser cooling water.

Richardsons Westgarth rotary strainers are made in a range of sizes from 160,000 g.p.h. to 5,000,000 g.p.h., they are self cleaning, operate continuously, and the accumulated sludge is blown out at intervals without interrupting the flow. *Please write for illustrated brochure.*

RICHARDSONS WESTGARTH (HARTLEPOOL) LTD.

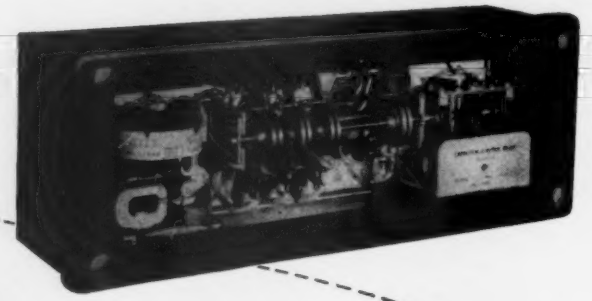
A member of the RICHARDSONS WESTGARTH GROUP

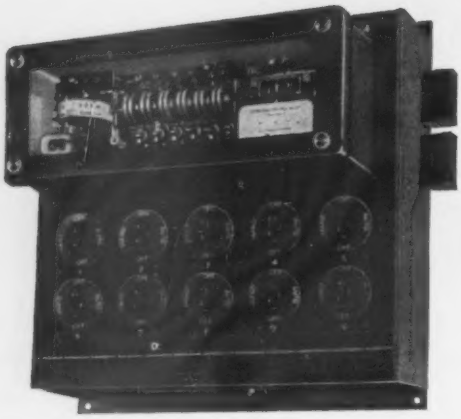
HARTLEPOOL, CO. DURHAM AND AT 58 VICTORIA STREET, LONDON, S.W.1.
59 MOSLEY STREET, MANCHESTER, 75 BUCHANAN STREET, GLASGOW.

Choose AEI relays and correct Power Factor AUTOMATICALLY

Type NJO4 relay for the control of single-step power capacitors.

A complete range of AEI relays is available for the control of capacitors as a means of improving the power-factor of industrial loads. Please write for full details.





Type NJO3 relay for the control of a number of capacitors or capacitor sections in sequence. It may be switchboard or wall-mounting pattern with or without control switches.

AEI

All enquiries should be addressed to the local AEI office or direct to—

Associated Electrical Industries Limited

INSTRUMENTATION DIVISION - Instrument & Meter Department

Trafford Park, Manchester 17

G/A 784

CLASSIFIED ADVERTISEMENTS

PUBLIC NOTICES

IMPERIAL COLLEGE

BURSARIES available for one-year course in Electric Traction from Oct., 1960. Candidates should preferably hold Honours degree in Electrical Engineering or qualifications of equivalent standard and have intention and possibility of working in the British transport or associated manufacturing industries. Value £400 with higher rates for industrial experience. Applications, by letter, as soon as possible and not later than 31 Aug. to Registrar, Imperial College, London S.W.7, from whom further details may be obtained. (R 494)

TENDERS INVITED

BOROUGH OF NEWBURY

Trunk Road Lighting Conversion Scheme

TENDERS are invited for the supply and erection of 30 140 watt sodium lanterns to replace existing 500 watt tungsten lanterns, including the moving of four steel columns to new positions and the erection of one new steel column.

Form of Tender, Specification and Bill of Quantities may be obtained from the Borough Surveyor, Municipal Bldgs, Newbury, at whose office plans and general conditions may be inspected.

Sealed tenders endorsed "Tender—Lighting" must be delivered to the undersigned not later than Monday, 8 Aug., 1960. The Corporation does not bind itself to accept the lowest or any tender.

LESLIE SOUTHERN,
Town Clerk.
(R 454)

CHELMSFORD BOROUGH COUNCIL

as Agents for

Chelmsford Borough and Rural District Joint Sewerage Committee

BROOKEND SEWAGE DISPOSAL WORKS EXTENSION No. 2

SUB-CONTRACT No. 16

THE above Council invite application from competent Electrical Contractors wishing to tender for sub-contract No. 16 which comprises the provision and installation of underground power cables, external site lighting on concrete columns, heating and lighting equipment for buildings, power distribution and control equipment, etc.

Application should be made, in writing, to Mr E. P. Allen, Surveyor to the Joint Sewerage Committee, Municipal Offices, Coval La, Chelmsford, giving details of similar works executed, not later than midday on Wednesday, 27 July, 1960.

Not more than six of the applicants will be selected and invited to tender for these works. Tender documents will be forwarded on Thursday, 28 July, 1960, and shall be completed and delivered in the endorsed envelopes provided not later than midday on Monday, 22 Aug., 1960.

The Council do not bind themselves to accept the lowest or any tender.

B. A. FRANCIS,
Town Clerk.
(R 492)

BOROUGH OF DROITWICH

STREET LIGHTING—A38

TENDERS are invited from experienced contractors for the supply, delivery and erection of 55 No. Plain Steel Street Lighting Columns, 30 ft mounting height, with 200 watt sodium lamps, together with wiring, lanterns and auxiliary gear, and the dismantling of 55 No. Existing Lighting Points.

Conditions of Contract and plan may be inspected at, and Specification, Bill of Quantities, and Form of Tender obtained from the Borough Engineer and Surveyor, Town Hall, Droitwich, during normal office hours upon payment of a deposit of £2 2s which sum will be returned on receipt of a bona fide tender and the return of all documents.

Tenders, in plain sealed envelopes, endorsed "Street Lighting—A38" to be delivered to the undersigned not later than 10 a.m. on Thursday, 28 July, 1960.

The Council do not bind themselves to accept the lowest or any tender.

S. G. FOSTER,
Town Clerk.

Town Hall,
Droitwich, Worcs. (R 421)

APPOINTMENTS VACANT

EASTERN ELECTRICITY BOARD

Essex Sub-Area

SOUTHEND DISTRICT

JOINTERS (E.H.T.)

187/60.R.

VACANCIES arise in the Southend District for Jointers (E.H.T.) and applications are invited from persons with suitable qualifications.

The rate of pay and conditions of service will be in accordance with the Agreement of the National Joint Industrial Council for the Electricity Supply Industry; present rate 5s 1½d per hour for a 42 hour week.

Applications in writing, stating age, experience and present employment should be forwarded to J. Linton, M.I.E.E., A.I.MECH.E., Manager, Southend District, Eastern Electricity Board, 85 London Rd, Southend-on-Sea, Essex, by 5 Aug., 1960. (R 486)

THE EAST MIDLANDS ELECTRICITY BOARD

Lincolnshire Sub-Area

TWO THIRD ASSISTANT DISTRICT ENGINEERS

LINCOLN DISTRICT

Vacancy No. 5/60.

SALARY: N.J.B. Class F, Grade 9, Scale 6, £800/£875 per annum.

The duties of the post will be to assist in the Planning, Construction, Operation and Maintenance of underground and overhead systems up to and including 11 kV.

The successful candidate will be required to reside in or near the City of Lincoln and to undertake standby duty.

Applications giving details of age, present position and salary, qualifications and experience should be addressed to The Manager, Lincoln District, Brayford Side North, Lincoln, within 14 days of the date of this advertisement. (R 481)

THE EAST MIDLANDS ELECTRICITY BOARD

Northamptonshire Sub-Area

FOURTH ASSISTANT ENGINEER

(SHIFT OPERATIONS)

Vacancy No. 79/60.

SALARY: Class K, Grade 12, Scale 7, £845/£930 per annum.

Candidates should have had experience of switching operations on a High Voltage distribution system, preferably including both Urban and Rural networks. Experience in the issue and cancellation of Permits to Work under the C.E. Safety Rules, or acting as Control Engineer for part of a High Voltage system, would be an advantage.

Applications giving details of age, present position and salary, qualifications and experience should be addressed to The Manager, Northamptonshire Sub-Area, 25 Bridge St, Northampton, within 14 days of the date of this advertisement. (R 482)

THE SOUTH WALES ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEER
NEWPORT DISTRICT
143/60.

APPLICATIONS are invited for the position of General Assistant Engineer (Substations) in the Newport District of the Monmouthshire and Mid-Wales Area of the Board.

Preference will be given to Engineers possessing the Higher National Certificate in Electrical Engineering.

The salary for the position will be in accordance with N.J.B. Class G, Grade 7, Scale 9 (£950/£1,055 per annum), but the successful applicant will be paid in accordance with N.J.B. Class G, Grade 6, Scale 10 (£1,010/£1,130 per annum) for the period he is responsible for controlling Rotary Substations in the District. This is expected to end in March, 1961, concurrent with the conclusion of DC/AC changeover.

GENERAL ASSISTANT ENGINEER
MERTHYR/ABERDARE DISTRICT
144/60.

Applications are invited for the position of General Assistant Engineer in the Merthyr/Aberdare District (based at Aberdare), in the Cardiff and East Central Area of the Board.

Preference will be given to Engineers possessing the Higher National Certificate in Electrical Engineering.

The salary for the position will be in accordance with N.J.B. Class G, Grade 11, Scale 5 (745/£830 per annum).

Applications stating age, present position, present salary, qualifications and experience should be addressed as follows:

143/60: D. G. Gwyn, B.SC., A.M.I.E.E., Manager, Monmouthshire and Mid-Wales Area, Llewelyn Rd, Cwmbran, Mon.;

144/60: C. L. Townsend, ASSOCIATE I.E.E., Manager, Cardiff and East Central Area, 445-447 Cowbridge Rd East, Cardiff;

so as to arrive not later than Saturday, 6 August, 1960.

Envelopes should be endorsed "General Assistant Engineer" and bear the appropriate vacancy number.

R. G. WILLIAMS,
Secretary.
(R 468)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 40s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or B. Salary includes London Allowance. Qualifications, entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

FOURTH ASSISTANT ENGINEER
MEASUREMENTS SECTION
ELECTRICAL DEPARTMENT
CHURCHFIELDS RD, BECKENHAM, KENT
Vacancy No. 60/521.

Candidates should have considerable experience of the repair, calibration and testing of polyphase meters, including bulk supply summation metering equipment, together with a knowledge of the repair, calibration and testing of indicating instruments. Experience of electronic techniques as applied to metering and measurements work would be a considerable advantage. The minimum qualification acceptable is the Higher National Certificate in Electrical Engineering, or its equivalent. Salary: Class T.S.BX, Grade 11, from 1 July, 1960, to 30 June, 1961, £775/£1,040; from 1 July, 1961, to 30 June, 1962, £810/£1,040 per annum.

MAINTENANCE SUPERINTENDENT
BLACKWALL POINT POWER STATION
Vacancy No. 60/524.

Sound technical training with experience in maintenance of modern generating station plant, including staff control and supervision of turbine and boiler overhauls. Salary: Class F, Grade 5, £1,060/£1,180 per annum.

Applications, quoting vacancy no., to (or on form from) Personnel Officer, Central Electricity Generating Board, London Division, P.O. Box 136, London W.1, by 5 Aug., 1960. (R 459)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

Central Gloucestershire Sub-Area

PRINCIPAL ASSISTANT
(ACCOUNTANT'S DEPARTMENT)
(HEADQUARTERS)

Duties will include responsibility for the Section dealing with the Stores Accounting and Control Records, clearance and payment of Creditors' invoices; payment of rents and wayleaves. Experience in supervision of staff and in punched card methods will be a distinct advantage and the possession of a recognised accountancy qualification is desirable. Salary: £1,250/1,355 per annum (N.J.C. Grade 7).

TRANSPORT OFFICER (HEADQUARTERS)

The main duties of the post will be to advise on and co-ordinate the operation and day-to-day maintenance of a fleet of some 300 vehicles in accordance with the Board's Scheduled Preventive Maintenance Scheme. The vehicles comprise cars, vans, lorries, mobile plant and special purpose vehicles stationed at Sub-Area Headquarters and at various detached District Depots. Duties also include the keeping of records of inspections of lifting tackle and the follow-up of cases where inspections have revealed any fault or weakness in this apparatus. Applicants should have had experience in the operation and maintenance of a mixed fleet of vehicles and possess a sound background knowledge of automotive engineering. Appropriate qualifications desirable. Salary £950/£1,055 per annum (N.J.B. Grade K.10).

Apply, by letter, within 14 days, stating age, experience, qualifications, present salary and position to Mr. S. Raybould, Sub-Area Manager, Midlands Electricity Board, Eastern Avenue, Gloucester.

Shropshire and Herefordshire Sub-Area

THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER (SHREWSBURY)

Duties will include advising consumers in respect of electrical equipment, particularly in the installation and maintenance of domestic and commercial refrigeration plant. Technical qualifications desirable. Salary £690/£785 per annum (N.J.B. Grade E.10).

Apply, by letter, within 14 days, stating

continued in next column

continued from previous column

age, experience, qualifications, present position and salary to Mr. W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gdns, Ditherington, Shrewsbury.

Wolverhampton & District Sub-Area

Keen young men are required for posts as Third and General Assistant District Engineers in the Cannock, Lichfield, Walsall and Wolverhampton Districts. Successful applicants will be required to assist in all the interesting activities of a District Engineer's Department. Technical qualifications desirable. Considerable prospects of promotion. Salaries, according to qualifications and experience, and the post and District to which appointed, will be within one of the following scales of Schedule A of the N.J.B. Agreement:

£845/£930 per annum
£800/£875 " "
£745/£830 " "
£690/£785 " "
£640/£725 " "

Apply, by letter, stating age and qualifications to Mr. D. Holt, Sub-Area Manager, Midlands Electricity Board, 83 Darlington St, Wolverhampton.

Worcester & District Sub-Area

WAYLEAVE OFFICER/SURVEYOR
(REDDITCH/BROMSGROVE)

Duties include surveying, profiling, plotting of routes, and negotiation and preparation of Wayleave Agreements, etc. Salary £780/£880 per annum (N.J.C. Grade 3).

WAYLEAVE OFFICER
(REDDITCH/BROMSGROVE)

Duties include plotting of routes and the negotiation and preparation of Wayleave Agreements, etc. Salary £700/£775 per annum (N.J.C. Grade 2).

Apply, by letter, within 14 days, stating age, experience, present position and salary to District Manager, Midlands Electricity Board, Windsor Rd, Redditch.

F. W. CATER,
Secretary.
(R 449)

THE NORTH WESTERN ELECTRICITY BOARD

FOURTH ASSISTANT DISTRICT ENGINEER
EAST DISTRICT, MANCHESTER

THE duties will include assisting in the supervision of the erection and maintenance of substation switchgear, laying and jointing of cables, keeping of substation records, etc. Applicants should hold H.N.C. in Electrical Engineering, and should have had practical experience in substation work, operation, cable laying and jointing, etc. Corporate Membership of the Institution of Electrical Engineers would be an advantage.

Salary Scale: £800/£875 p.a. Grade H.11. N.J.B. Conditions.

Application Forms to be obtained from the Manager (Staff Vacancy), No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, and returned to him by 3 Aug., 1960. (R 450)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

GENERAL ASSISTANT ENGINEERS

REQUIRED at Ironbridge Power Station for generation operational duties. N.J.B. service conditions, superannuable appointment. Salary within Schedule A, J14, £690/£785 per annum; a shift enhancement of £90 will be paid when engaged on shift duties.

Applicants should have received a sound technical training and preferably have had some industrial engineering experience and have as a minimum qualification the Ordinary National Certificate.

Apply, quoting vacancy number 188/60MD on forms AE6 which are available from the Station Superintendent, Ironbridge Power Station, Buildwas, Salop, to whom they should be returned when completed not later than 3 August, 1960.

Previous applicants will be reconsidered and need not re-apply. (R 451)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

APPOINTMENT OF
THIRD ASSISTANT DISTRICT ENGINEER
(RUTHERGLEN DISTRICT)

APPLICATIONS are invited for the appointment of Third Assistant District Engineer in the Rutherglen District. Applicants should have experience in the operation and maintenance of H.V. and L.V. distribution systems and be conversant with Load Flow Diagrams and Voltage Drop Calculations.

The conditions of service for the appointment will be in accordance with the National Joint Board Agreement and the salary will be £845/£930 per annum, Grade G9. It is a condition of this appointment that the successful applicant shall reside within a reasonable distance of the District Office at Cambuslang and take standby duty in accordance with the above agreement.

Application forms which may be obtained from the undersigned should be returned to this office within 14 days of the date of this advertisement.

R. J. RENNIE,
Manager.
Montrose Cres,
Hamilton. (R 448)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Northern Area

APPLICATIONS are invited for the post of District Engineer in No. 3 District. The District embraces the East Coast of Ross-shire and part of Sutherland.

The District Office is in Dingwall where the successful applicant will require to reside.

Applicants should be fully experienced in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution networks, substation plant and ancillary apparatus, and be capable of taking charge of all engineering matters in a predominantly rural District. Minimum technical requirements: Higher National Certificate in Electrical Engineering.

Superannuation Scheme applicable.

Salary: N.J.B. Class D, Grade 2, £1,080/£1,215.

Application forms for the post may be obtained from the Area Manager, Church St, Dingwall, and should be returned duly completed by 8 Aug., 1960. (R 444)

GOVERNMENT OF WESTERN AUSTRALIA

AN experienced X-ray Engineer is required for the maintenance and installation of X-Ray equipment in Government Hospitals in Western Australia. The successful applicant will join the staff of the State X-Ray Laboratory, an organisation within the Medical Department of the Government of Western Australia.

Applicants should give full details of their experience and qualifications, the names and addresses of two referees and the earliest date at which they could commence duties.

Salary: Commencing salary will be in the range of £A1,271 to £A1,379 according to experience and qualifications. In special circumstances higher rates would be considered.

Conditions, sick leave, etc., similar to the State Public Service. Two weeks' annual leave, three months' Long Service Leave after 7 years.

Assistance towards cost of fare will be arranged.

Applications in duplicate should be made without delay to:

Agent General for Western Australia,
Savoy House,
115 The Strand.
London W.C.2.
England.

Further details will be supplied on request to the above. (R 443)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 1 Sub-Area

FOURTH ASSISTANT COMMERCIAL ENGINEER

REQUIRED at No. 1 Sub-Area Headquarters, Liverpool.

Salary within the range £890/£990 per annum (N.J.B. M/13).

Applicants should have experience in the commercial and domestic application of electricity and be capable of advising on and estimating for electrical installation work in all classes of commercial premises. Some knowledge of the design, installation and operation of floor-warming schemes would be an advantage. Applicants should have suitable technical qualifications.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 1 Sub-Area, 24 Hatton Garden, Liverpool 3, should be completed and returned not later than 31 July, 1960. (R 474)

SOUTH EASTERN ELECTRICITY BOARD

DISTRICT COMMERCIAL ASSISTANT

EASTBOURNE district. Salary £700 x £25—£775 per annum under N.J.C. Agreement, Grade 2. Superannuable. Applicants should be able to deal with consumers' enquiries and give advice on supply matters, tariffs, appliances and domestic and commercial installations. A thorough knowledge of electrical appliances and the ability to quote for small contracting work is necessary. Applications quoting ET and naming two referees to District Manager, Seeboard, Electric House, Grove Rd, Eastbourne, by 3 August, 1960.

LADY DEMONSTRATOR
THANET DISTRICT

Annual salary £600 x £25—£700 under N.J.C. Grade 1. Superannuable. Applicants should possess a recognised diploma or certificate in domestic science, also E.A.W. certificate. The successful candidate will be required to conduct lectures and demonstrations, advise consumers and generally assist in the showrooms. Applications quoting ET and naming two referees to District Manager, Seeboard, Electricity Offices, St. Peter's, Broadstairs, Kent, by 3 August, 1960.

SHOWROOM ASSISTANT (MALE)
CROYDON AND PURLEY DISTRICT

Annual salary £285 at 16 to £490 at 21 rising to £600, £680 or £740 according to qualifications obtained and ability. Duties will include general showroom work and the advising of consumers on the use of electrical apparatus. The appointment is primarily for the Croydon showroom, but the successful applicant may be required to work occasionally in any showroom of the Croydon and Purley district. He may also be required to carry out cashier duties.

Applications quoting ET and naming two referees on forms from District Manager, Seeboard, Electric House, Wellesley Road, Croydon, by 3 August, 1960.

DISTRICT SENIOR COMMERCIAL ASSISTANT
CROYDON AND PURLEY DISTRICT

Salary £934 10s. rising to £1,060 per annum under N.J.C. Grade 4, including London Allowance. Superannuable. Applications are invited for the above position in the development section. Applicants should possess a sound knowledge of industrial techniques, Electricity Supply Regulations, Factories Act, and tariff structure. The possession of the H.N.C. in electrical engineering will be an advantage. The duties will include dealing with industrial consumers. Applications quoting ET and naming two referees on forms from District Manager, Seeboard, Electric House, Wellesley Rd, Croydon, by 3 August, 1960.

ASSISTANT DISTRICT ENGINEER
CRAWLEY AND HORSHAM DISTRICT

Salary within the range £845/£930 under N.J.B. Class F, Grade 8. Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead distribution systems up to 11 kV. The successful applicant will be required to reside

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within the district and undertake standby duties. Subject to certain conditions, housing accommodation may be available at Crawley. Applications quoting ET and naming two referees to District Manager, 50-52 The Broadway, Crawley, by 3 August, 1960.

SENIOR SHOWROOM ASSISTANT (MALE)
LEWES DISTRICT

Salary £700 x £25—£775 per annum under N.J.C. Grade 2 according to experience. Applicants should possess the E.D.A. salesmanship certificate and have experience of showroom procedure and be able to arrange displays of apparatus. The successful applicant will be required to work in any of the district's four showrooms at Lewes, Seaford, Newhaven and Peacehaven and to carry out cashier duties when necessary. Applications quoting ET and naming two referees on forms from District Manager, Seeboard, 80-81 High St, Lewes, by 3 August, 1960.

GEORGE WRAY,
Secretary.
(R 471)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 4 Sub-Area

FOURTH ASSISTANT ENGINEER
(CONSTRUCTION)

BASED at Newtown.

Salary within range £910/£955 per annum (N.J.B. L/12).

Duties will include the laying out, erecting and setting to work of overhead and underground mains.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity Hse, Rhostyllen, nr. Wrexham. Closing date: 31 July, 1960. (R 435)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

THIRD ASSISTANT ENGINEERS

(a) KING'S LYNN AND WESTERN DISTRICT
185/60.R.

(b) BARNET DISTRICT
186/60.R.

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. systems including substations.

Salary: N.J.B. Class F, Grade 9 (£800/£875) plus London Allowance for post (b).

Apply by letter by 5 Aug., 1960, to: (a) The Manager, King's Lynn and Western District, Eastern Electricity Board, Gaywood Bridge, King's Lynn, Norfolk.

(b) F. G. Bromley, B.SC.(HONS.)ENG., M.B.I.M., M.I.E.E., Manager, Eastern Electricity Board, 7c High Street, Barnet, Herts.

Chilterns Sub-Area

WATFORD DISTRICT

(a) THIRD ASSISTANT ENGINEER
184/60.R.

(b) GENERAL ASSISTANT ENGINEER
188/60.R.

Candidates for (a) should have had a sound technical training and be experienced in the construction, operation and maintenance of H.V. and L.V. underground systems including substations and switchgear. Knowledge of overhead lines would be an advantage.

Candidates for (b) should have had a sound general and technical education and possess the Higher National Certificate or equivalent qualification.

Some experience in the operation and maintenance of H.V. and L.V. distribution systems would be an advantage.

Salary: N.J.B. Class G: (a) Grade 9 (£845/£930); (b) Grade 14 (£595/£670 progressing to £725 subject to satisfactory and continuous service). Plus London Allowance.

Apply by letter by 5 Aug., 1960, to the Manager, Watford District, Eastern Electricity Board, The Parade, High St, Watford. (R 487)

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following appointment:

FOURTH ASSISTANT ENGINEER
SYSTEM OPERATION DEPARTMENT
THAMES NORTH GRID CONTROL CENTRE
REDBOURN, NR. ST. ALBANS, HERTS

Salary: N.J.B. Class BX, Grade 9/11, within the range of Scales 8/10, £735/£1,130 per annum. The commencing salary will be within the range at a point commensurate with qualifications and experience.

Applicants should have qualifications to Higher National Certificate standard and should be prepared ultimately to undertake shift duties in the Area Grid Control Room. Some steam generating station experience is desirable.

Forms of Application (AE.6/ACT) may be obtained from any Divisional Office of the Board, and should be addressed to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, to arrive not later than 30 July, 1960, quoting Staff Vacancy No. 1207. (R 446)

YORKSHIRE ELECTRICITY BOARD

No. 3 (Sheffield) Sub-Area

ASSISTANT ENGINEERS (CONSUMERS)
TWO POSTS

APPLICANTS should possess a Higher National Certificate in Electrical Engineering or equivalent qualification. Experience of negotiating with consumers requiring medium voltage supplies and knowledge of the wiring rules and regulations of the I.E.E. will be an advantage.

These posts offer an excellent opportunity to General Assistant Engineers both in the Engineering and Commercial departments who wish to widen their experience.

Salary: N.J.B. Class L, Grade 13, Scale 7, £845/£930 per annum.

SHEFFIELD DISTRICT
DISTRICT ENGINEERING DRAUGHTSMAN

Candidates should be in possession of the Ordinary National Certificate, and be experienced in mains surveying and the recording of mains work.

Salary: Present Scale 3, £640/£725 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, Yorkshire Electricity Board, No. 3 (Sheffield) Sub-Area, Commercial St, Sheffield, not later than 5 August, 1960. (R 470)

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern and Yorkshire Region

APPOINTMENT OF SENIOR ASSISTANT ENGINEER
ELECTRICAL MEASUREMENTS SECTION
TECHNICAL DEPARTMENT

APPLICATIONS are invited for the appointment of a Senior Assistant Engineer to take charge of the Electrical Measurements Section with location at Darlington.

Candidates should have a wide theoretical and practical knowledge of electrical measurements and be corporate members of the Institution of Electrical Engineers. Responsible experience in the application and maintenance of integrating meters and indicating instruments in large high-voltage circuits, and of the administration of this work, is required.

The salary for this appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Schedule B, Class AX, Grade 3 (£1,365/£1,605 per annum) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from the Assistant Regional Secretary (Personnel) Central Electricity Generating Board, North Eastern and Yorkshire Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 22 Aug., 1960. (R 477)

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

GENERAL ASSISTANT ENGINEER
(TECHNICAL RECORDS)

AT Plymouth "B" Power Station. Superannuation Scheme. Salary: N.J.B. Class H, Grade 15, Scale 2, £595/£670 per annum. (Please quote ET. 92/60.)

The duties will consist mainly of the compilation of technical records and statistics.

The possession of a technical qualification is desirable.

Applications on Form AE6/ACT obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 25 July, 1960.

STATION SHIFT CONTROL ENGINEER
at Newton Abbot Power Station.

Superannuation Scheme. Salary: N.J.B. Class F, Grade 10, Scale 5, £745/£830 per annum plus £90 shift allowance.

Candidates should possess good qualifications and have had training and experience in the control and operation of steam generating plant and main switchgear.

Applications on Form AE6/ACT (please quote ET/93/60) obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 3 Aug., 1960. (R 458)

SOUTHERN ELECTRICITY BOARD

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)
(Z.1224)

SALISBURY District of No. 4 (Bournemouth) Sub-Area. Salary: N.J.B. Class F, Grade 9 (£800/£875 per annum). N.J.B. conditions of service.

The successful candidate will be required to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations, and with minor construction work. Applicants should have had sound experience in electricity supply distribution and the possession of suitable technical qualifications will be an advantage. The successful candidate will be required to carry out standby duties if and when called upon to do so.

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)
(Z.1225)

Weymouth District of No. 4 (Bournemouth) Sub-Area. Salary: N.J.B. Class F, Grade 9 (£800/£875 per annum). N.J.B conditions of service.

The successful candidate will be required to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations, and with minor construction work. Applicants should have had sound experience in electricity supply distribution and the possession of suitable technical qualifications will be an advantage. The successful candidate will be required to carry out standby duties if and when called upon to do so.

ASSISTANT ENGINEER
(PLANNING)
(Z.1226)

Southampton District of No. 4 (Bournemouth) Sub-Area. Salary: N.J.B. Class H, Grade 10 (£845/£930 per annum). N.J.B. conditions of service.

The successful candidate will be required to assist in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks. Applicants should have had sound experience in electricity supply distribution and the possession of suitable technical qualifications would be an advantage. The successful candidate will be required to carry out standby duties if and when called upon to do so.

Applications for the above appointments on forms obtainable from the Sub-Area Secretary, 1 Priory Rd, Bournemouth, and returned to him, quoting the appropriate "Z" number, not later than 31 July, 1960.

ASSISTANT ENGINEER (LOCAL)

Staines District of No. 1 (Southall) Sub-Area, located at Sunninghill. Salary: N.J.B. Class G, Grade 9 (£845/£930 per annum). N.J.B. conditions of service.

Applicants should have had experience in operation and maintenance work on over-

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head and underground distribution systems up to and including 11 kV.

Applications on forms obtainable from the Sub-Area Secretary, 2/6 Windmill La, Southall, Middlesex, and returned to him, quoting Z.1227, not later than 31 July, 1960.

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)

Salisbury District of No. 4 (Bournemouth) Sub-Area. Salary: N.J.B. Class F, Grade 11 (£690/£785 per annum). N.J.B. conditions of service.

The successful candidate will be required to give general assistance in the maintenance and operation of H.V. and L.V. distribution mains and substations, and with minor construction work. Applicants should have had sound experience in electricity supply distribution and the possession of suitable technical qualifications will be an advantage. The successful candidate will be required to carry out standby duties if and when called upon to do so.

Applications on forms obtainable from the Sub-Area Secretary, 1 Priory Rd, Bournemouth, and returned to him, quoting Z.1147, not later than 31 July, 1960.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

LINESMAN (OVER 30,000 VOLTS)

Basingstoke District of No. 3 (Portsmouth) Sub-Area. The rate of pay will be 61·75d per hour, with N.J.I.C. conditions of service.

The successful candidate will be required to carry out all work in connection with the erection and maintenance of overhead transmission, distribution and service lines, and any equipment or apparatus in connection therewith, and to run Kalibond or similar systems of wiring.

Applications on forms obtainable from the District Manager, Manor Hse, Winchester Rd, Basingstoke, and returned to him, quoting Z.1222, not later than 31 July, 1960.

FITTER (ELECTRICAL)

Basingstoke District of No. 3 (Portsmouth) Sub-Area. The rate of pay will be 61·75d per hour, with N.J.I.C. conditions of service.

Candidates should have experience in the work of fitting and erecting high voltage O.C.Bs, isolators and other substation equipment.

Applications on forms obtainable from the District Manager, Manor Hse, Winchester Rd, Basingstoke, and returned to him, quoting Z.1223, not later than 31 July, 1960. (R 476)

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following appointment:—

THIRD ASSISTANT ENGINEER
(TELECOMMUNICATIONS)
ELECTRICAL DEPARTMENT
(REDBOURN, NR. ST. ALBANS, HERTS)

Salary: N.J.B., Class BX, Grade 8, Scale 11, £925/£1,215 per annum.

Applicants should possess a Higher National Certificate, Final City and Guilds Certificate or equivalent qualification, and should have had several years' experience in one or more of the following:

Installation, maintenance and testing of:
Automatic Telephone Equipment
Telemetering Systems
Supervisory Control Equipment.

A knowledge of the Generating Board's Standardised Central Indicating System would be an advantage.

The successful applicant will be required to reside within a reasonable distance of Redbourn.

Applications, quoting reference Staff Vacancy No. 1373, stating age, qualifications, experience and present position should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, by 30 July, 1960. (R 445)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

FOURTH ASSISTANT ENGINEER
(SERVICES)
CANTERBURY DISTRICT
Vacancy No. 121A/60T.

CANDIDATES must possess either an engineering degree, the H.N.C. in Electrical Engineering or equivalent qualifications, and be interested in automatic protective gear and control gear associated with major electrical plant in generating stations and substations.

Salary: Class AX, Grade 11, £735/£930 per annum with prospect of promotion to Grade 9, £840/£1,055 per annum subject to satisfactory progress.

Applications giving age, details of experience, present position, etc., and quoting vacancy number, should be sent to the Personnel Officer, Central Electricity Hse, Lower Ham Rd, Kingston upon Thames, Surrey, to arrive by 2 Aug., 1960. (R 478)

THE NORTH EASTERN ELECTRICITY BOARD

Wear Sub-Area

APPLICATIONS are invited for the appointment of SECOND ASSISTANT ENGINEER, Sub-Area Engineer's Department, Construction Section, with location at Wear Sub-Area Headquarters, Sunderland. Applicants should have had an extensive experience in the construction of substations, installation of switchgear, erection of overhead lines, and installation of underground cables up to and including 66 kV. Candidates should preferably be Corporate Members of the I.E.E. or have qualifications leading up to this. Salary: Schedule A, Class L, Grade 7, £1,245/£1,410 per annum. N.J.B. conditions of service.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box 117, Carliol House, Newcastle upon Tyne, within 10 days of the appearance of this advertisement. (R 475)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

GENERAL ASSISTANT ENGINEER

REQUIRED at Hams Hall Power Station, Birmingham, for generation operational duties. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K14, £745/£830 per annum. An allowance of £90 is payable when engaged on shift duties.

The appointment is permanent with excellent opportunities for advancement. It is necessary that applicants should have received a sound technical training and should preferably have had some industrial engineering experience and have as a minimum qualification the Ordinary National Certificate.

Apply, quoting vacancy number 194/60MD on form AE6 available from the Station Superintendent, Hams Hall Power Station, Lea Marston, Sutton Coldfield, Warwicks, by 3 August, 1960. (R 469)

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

ASSISTANT ENGINEER (INSTRUMENTS)
EARLEY GENERATING STATION, READING
SEC/3.93/T.

APPLICANTS should have previous experience of generating station plant, a good knowledge of the instruments and other measuring apparatus used and have had a sound technical training. Preference will be given to those possessing qualifications leading to corporate membership of an appropriate professional institution or equivalent qualifications.

Accommodation may be available to the successful applicant.

Salary: N.J.B., G.10, £800/£875.

Special application forms obtainable only from Divisional Secretary, 111 High St, Portsmouth, should be returned by 3 Aug., 1960. Please quote reference number. (R 483)

CENTRAL ELECTRICITY GENERATING BOARD
South Western Division
GENERAL ASSISTANT ENGINEERS

REQUIRED at Portishead "B" Power Station, nr. Bristol.

Superannuation Scheme. Salary, N.J.B. Class K, Grade 15, Scale 4, £690/£785 per annum.

Preference will be given to candidates who hold or are at present studying for a Higher National Certificate or similar qualifications. Previous applicants need not re-apply.

Applications on Form AE6/ACT obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 3 August, 1960. (R 467)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD
No. 2 Sub-Area
SECTION ENGINEER

REQUIRED in the Northwich District of the Board's No. 2 Sub-Area. Salary within range £890/£990 per annum (N.J.B. F/7).

Applicants should have experience in the construction and operation of overhead and underground distribution systems including indoor and outdoor substation equipment. A technical qualification is desirable.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 2 Sub-Area, Sandiway House, Northwich, Cheshire. Closing date 31 July, 1960. (R 472)

CENTRAL ELECTRICITY GENERATING BOARD
Southern Division
FOURTH ASSISTANT ENGINEER
UXBRIDGE TRANSMISSION SECTION
SEC/3.96.

APPLICANTS should have had experience in the maintenance and operation of 132 kV transforming stations and grid lines.

Preference will be given to those possessing qualifications leading to corporate membership of a recognised professional institution or equivalent qualifications.

Salary: N.J.B. AX11, £735/£930.

Special application forms (not AE6/ACT) obtainable only from Divisional Secretary, 111 High St, Portsmouth, should be returned by 4 Aug., 1960. (R 484)

CENTRAL ELECTRICITY GENERATING BOARD
East Midlands Division
GENERAL ASSISTANT ENGINEER
HIGH MARNHAM POWER STATION
Vacancy No. 171/60.

APPLICATIONS are invited for the position of General Assistant Engineer at High Marnham Power Station, nr. Newark, Notts.

Applicants should hold the Ordinary National Certificate in Mechanical or Electrical Engineering. There are good opportunities for keen engineers who are willing to study new plant and methods.

The salary during the initial training period will depend upon qualifications and knowledge and will be within the range £550/£725 per annum of the National Joint Board Agreement.

Closing date for receipt of applications: 29 July, 1960.

ASSISTANT SHIFT CHARGE ENGINEER
DRAKELOW "A" POWER STATION
Vacancy No. 170/60.

Applications are invited for the position of Assistant Shift Charge Engineer at Drakelow "A" Power Station, Drakelow, nr. Burton-on-Trent.

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate, or its equivalent.

Salary will be in accordance with Class J, Grade 8 (£1,010/£1,130 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 29 July, 1960.

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PLANT CONTROL ENGINEER
CASTLE DONINGTON POWER STATION
Vacancy No. 172/60.

Applications are invited for the position of Plant Control Engineer at Castle Donington Power Station, nr. Derby.

Candidates should have had operating experience on large modern pulverised fuel-fired boilers and associated turbines.

The possession of the Ordinary National Certificate, or the pursuit of studies leading thereto, will be an advantage.

Salary will be in accordance with Class L, Grade 10 (£1,010/£1,130 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 29 July, 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Station Superintendent concerned, and should be returned to the Station by the date stated.

O. S. WOODS,
Divisional Controller.
(R 480)

CENTRAL ELECTRICITY GENERATING BOARD
East Midlands Division
ASSISTANT SHIFT CHARGE ENGINEERS
HIGH MARNHAM POWER STATION
Vacancy No. 180/60.

APPLICATIONS are invited for the position of Asssitant Shift Charge Engineer at High Marnham Power Station, Nr. Newark, Notts.

Applicants should have had a sound technical training and practical experience in a large modern generating station. Preference will be given to candidates with qualifications leading to Corporate Membership of the Institution of Electrical or Mechanical Engineers.

The salary will be in accordance with Class M, Grade 8 (£1,245/£1,410 per annum), of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 5 Aug., 1960.

SHIFT CHARGE ENGINEERS
HIGH MARNHAM POWER STATION
Vacancy No. 179/60.

Applications are invited for the position of Shift Charge Engineer at High Marnham Power Station, Nr. Newark, Notts.

Applicants should have had a sound technical training and considerable experience in a large modern power station. The possession of the Higher National Certificate or equivalent would be an advantage.

The salary will be in accordance with Class M, Grade 6 (£1,445/£1,605 per annum), of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 5 Aug., 1960.

ASSISTANT MAINTENANCE ENGINEER (ELECTRICAL)
COVENTRY POWER STATION
Vacancy No. 176/60.

Applications are invited for the position of Assistance Maintenance Engineer (Electrical) at Coventry Power Station, Alderman's Green, Coventry.

Applicants should have received a thorough technical and practical training, with experience in testing protective gear, maintenance of alternators, transformers, switchgear and associated equipment.

Preference will be given to candidates who hold a recognised qualification.

Salary will be in accordance with Class G, Grade 8 (£890/£990 per annum), of the National Joint Board Agreement.

Closing date for receipt of applications: 5 Aug., 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be

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obtained from the Station Superintendent concerned, and should be returned to the Station by the date stated.

O. S. WOODS,
Divisional Controller.
(R 479)

CENTRAL ELECTRICITY GENERATING BOARD
Midlands Division
STATION SHIFT CONTROL ENGINEER

REQUIRED at Ironbridge Power Station, Salop, N.J.B. service conditions, superannuable appointment. Salary within Schedule A of the Agreement, Grade J10, £890/£990 per annum, plus 10% of basic salary for shift duties.

A sound technical training and practical experience in the control of steam generating plant and main switchgear are required. Appropriate technical qualifications an advantage.

Apply, quoting Vacancy No. 189/60MD on from AE6, available from the Station Superintendent, Ironbridge Power Station, Buildwas, Salop. Closing date for receipt of applications: 3 Aug., 1960. (R 452)

CENTRAL ELECTRICITY GENERATING BOARD
Southern Division
GRADE 10 ENGINEER
POOLE GENERATING STATION
SEC/3.94.

THE successful applicant will be given the opportunity of gaining experience in oil fired plant operation, control room duties and maintenance work. Operating experience of modern generating station plant is essential.

Preference will be given to those possessing qualifications leading to corporate membership of a recognised professional institution or equivalent qualifications.

Salary N.J.B. K/10 £950/£1,055.

Special application forms (not AE6/ACT) obtainable only from Divisional Secretary, 111 High St, Portsmouth, should be returned by 3 August, 1960. (R 473)

CENTRAL ELECTRICITY GENERATING BOARD
South Wales Division
Vacancy No. 190/ET/60.

APPLICATIONS invited for the superannuable N.J.B. appointments of SHIFT CHARGE ENGINEERS at Rogerstone Power Station, Risca Rd, Rogerstone, Mon.

Salary: Schedule A, Class G, Grade 6, Scale 10, £1,010-£1,130 per annum plus 10% shift enhancement.

Applicants should possess H.N.C., or equivalent qualifications, and have had operating experience in a modern Power Station.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-Fedwen Rd, Gabalfa, Cardiff, to be returned by 5 Aug., 1960. (R 485)

CENTRAL ELECTRICITY GENERATING BOARD
Midlands Division
GENERAL ASSISTANT ENGINEER

REQUIRED at Nechells "A" and "B" Power Stations, Birmingham, for generation operational duties. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K14, £745/£830 per annum. An allowance of £90 is payable when engaged on shift duties.

The appointment is permanent with excellent opportunities for advancement. It is necessary that applicants should have received a sound technical training and should preferably have had some industrial engineering experience and have as a minimum qualification, the Ordinary National Certificate.

Apply, quoting vacancy number 185/60MD on form AE6, available from the Station Superintendent, Nechells Power Station, off Aston Church Rd, Nechells, Birmingham 7, by 3 August, 1960. (R 436)

THE ELECTRIC CONSTRUCTION COMPANY LIMITED

BUSHBURY ENGINEERING WORKS, WOLVERHAMPTON

Good Vacancies Exist for

SENIOR ELECTRO-MECHANICAL DRAUGHTSMEN

for

Transformers and Rectifiers

Excellent working conditions. Sound Pension and Profit Sharing Scheme in operation.

Apply:—

The Technical Manager, Transformers/Rectifiers
At the above address

(R 447)

ASSISTANT TEST ENGINEER for new Testing Laboratory dealing with electrical wiring accessories, cartridge fuses, etc. Applicants should have at least O.N.C. or equivalent, and have had previous experience in a similar capacity. A good salary will be offered according to age, experience and qualifications. Applications treated in strict confidence if addressed to Technical Manager, M.K. Electric Ltd., Shrubbery Rd, Edmonton, N.9. (R 433)

A. J. SMITH, Consulting Engineer, requires SENIOR and SEMI-SENIOR ELECTRICAL ENGINEER for the design and supervision of a variety of electrical installations. Four weeks holiday per year, subsidised meals, sick pay scheme and non-contributory pension. Please send full details of qualifications, training and experience, together with approximate salary required, to 19 Bolsover St, London W.1, *marking the envelope "Confidential."* (R 438)

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CONSULTING ENGINEERS require ASSISTANT ELECTRICAL ENGINEERS to undertake wide range of activities from industrial installations to plant specification and inspection. Minimum qualification: H.N.C. Non-contributory pension fund. Send full particulars in writing to: Messrs Mackness and Shipley, Consulting Engineers, Parliament Mansions, Abbey Orchard St, London S.W.1. (R 455)

ESTIMATING ENGINEER, with experience of estimating installation contracts, required in the Westminster Office of Electrical Engineers and Contractors. Pension and Bonus Schemes in operation. Applications, stating details of age and experience, to Box No. 7935, Electrical Times. (R 465)

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(R 493)

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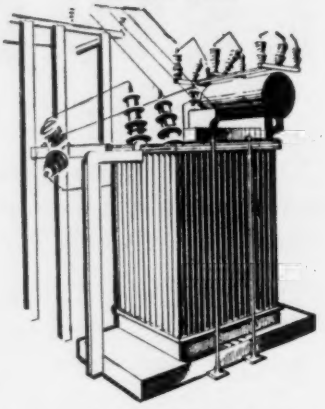

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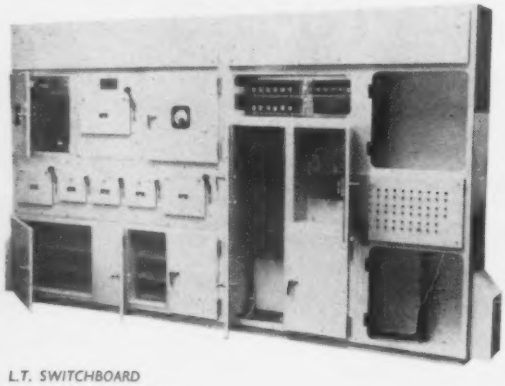

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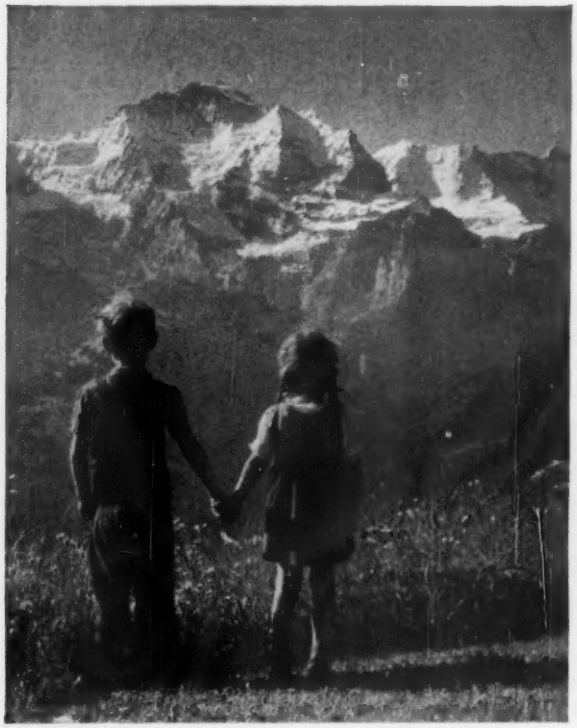

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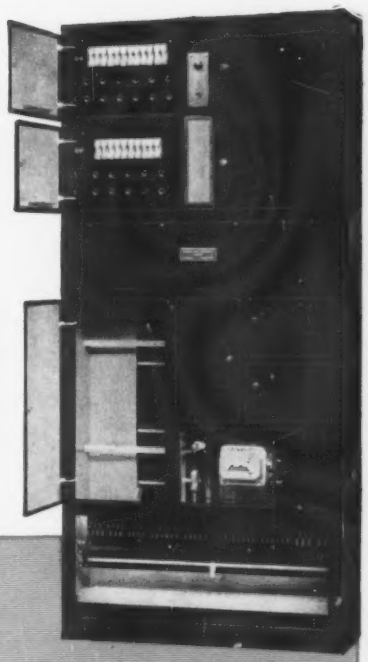
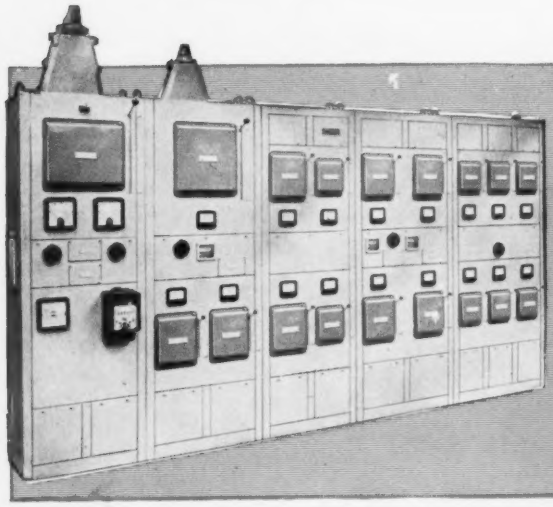
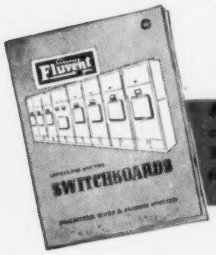


An unusual Cubicle Board (right) which provides a variety of lighting fuseboards with tumbler switch panels. It is installed in St. George's Chapel, Windsor.



Installed in a modern manufacturing undertaking, this Board (above) protects one 300 amp. eight 100 amp. and eight 60 amp. 3 phase 4 wire outgoing circuits, and the incoming Cubicle on the left is provided with a 600 amp. main switch and metering facilities.

A compact Board (right) protecting one 300 amp. and two 60 amp. 3 phase 4 wire circuits and six 30 amp. single phase and neutral circuits, all under the control of a 600 amp. T.P. and Neutral incoming main switch.



Publication No. ... describes a selection of Cubicle and Unit Type Switchboards. A copy will be forwarded to you on request.

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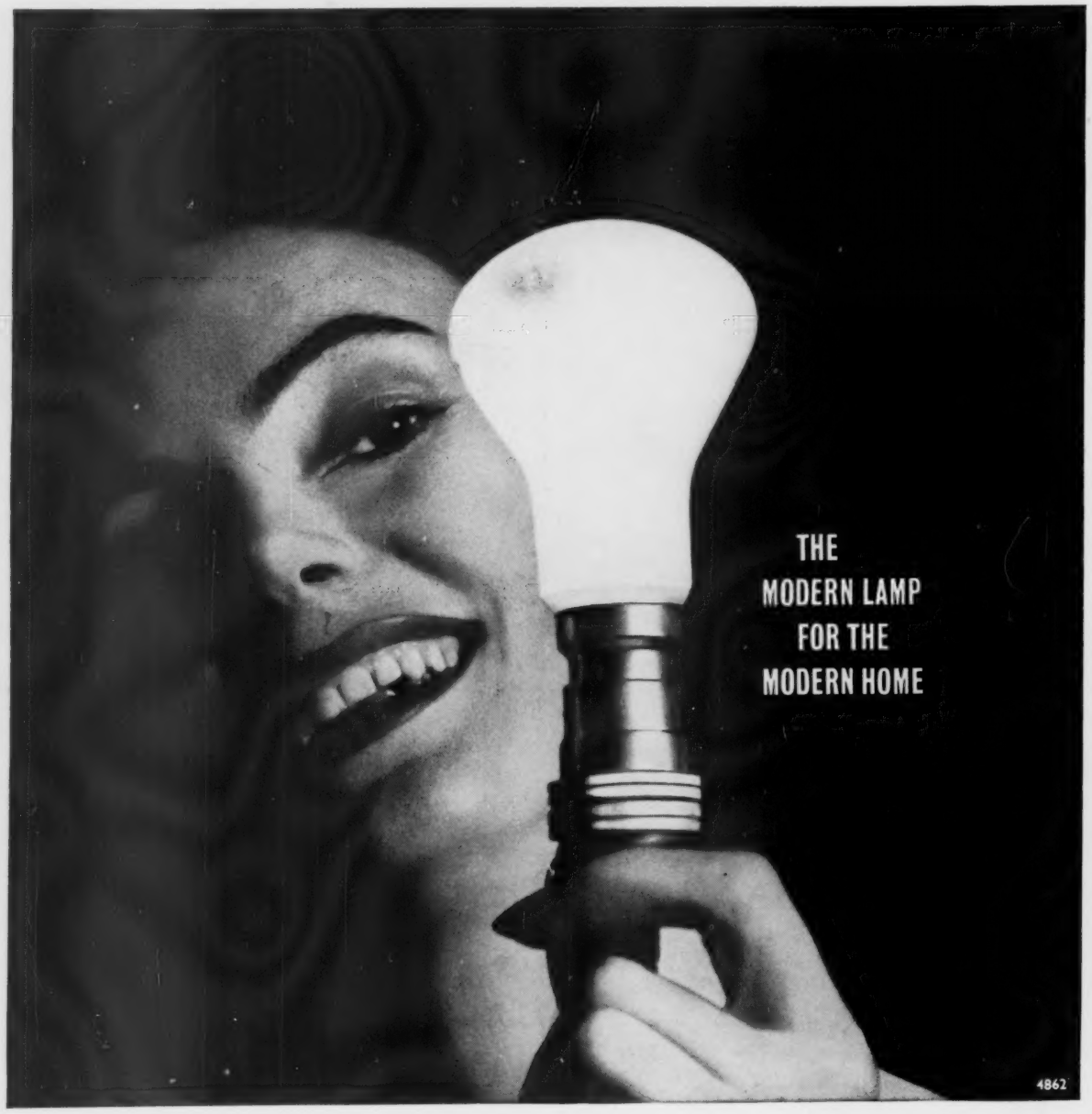
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